May 1983

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sinclair user

Issue No 14

Only 75p

SAVE MONEY WITH OUR GROWING USER CLUB



Clive surprises business students

We look inside Sinclair's new offices

Spectrum's colourful rival reviewed

We reveal better ZX-81 graphics

How to get away from Basic language

We return to the land of the Hobbit

SPECTRUM JOINS THE GOOD BUDDIES —User of the Month

BIGGEST ISSUE EVER

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sinclair user

incorporating Spectrum User

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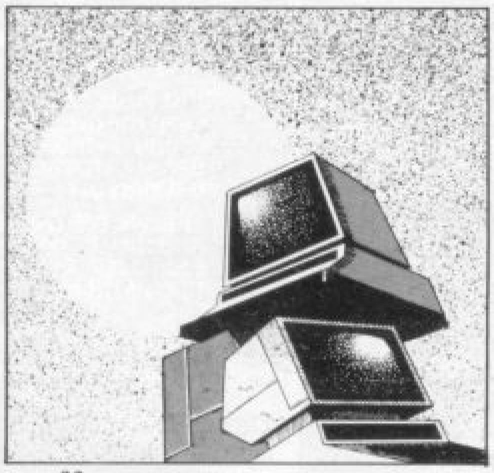
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Sinclair User and Programs,
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NEXT MONTH
Stephen Adams reviews the Basicare modules for the ZX-81 and we assess the growing numbers of information filing systems.

"IT LOOKS NICE BUT WHAT THE HELL CAN I DO WITH IT?"

Every ZX SPECTRUM Print'n'Plotter Jotter has 100 pages of finely printed screen grids.

50 for the high resolution screen. 50 for the normal character screen.

With these at your disposal you can plan practically any graphics print-out to program into your computer.

The high-resolution PLOT grid shows every one of the 45,060 pixels! Every one printed. Every one with its co-ordinate numbers. This gives you enormous graphics power to DRAW, PLOT, CIRCLE, PLOT OVER and so on in any position or screen building up graphic drawings, charts, maps . . . in fact anything without the complications of guesswork, integer out of range, or wrongly positioned pixel colours which change PRINTed INK characters!

The normal character PRINT grids on the other hand will allow you to be specific about PRINT AT, TAB, PRINT OVER, SCREEN$ and INK/PAPER in direct co-ordination with PLOT . . . you see every page is printed on **high quality tracing paper** . . . ideal to overlay on to illustrations and 'copy' or co-ordinate.

And there's another bonus, because each page contains 24 User-definable grids — **2400 per pad!**

With 50 pages of PLOT grids, 50 pages at PRINT grids 2400 user-definable grids, a set of colour pens, a printed PIXEL RULER and our Special Offer of demo programs, IT'S THE BEST VALUE IN ZX GRAPHICS PROGRAMMING.



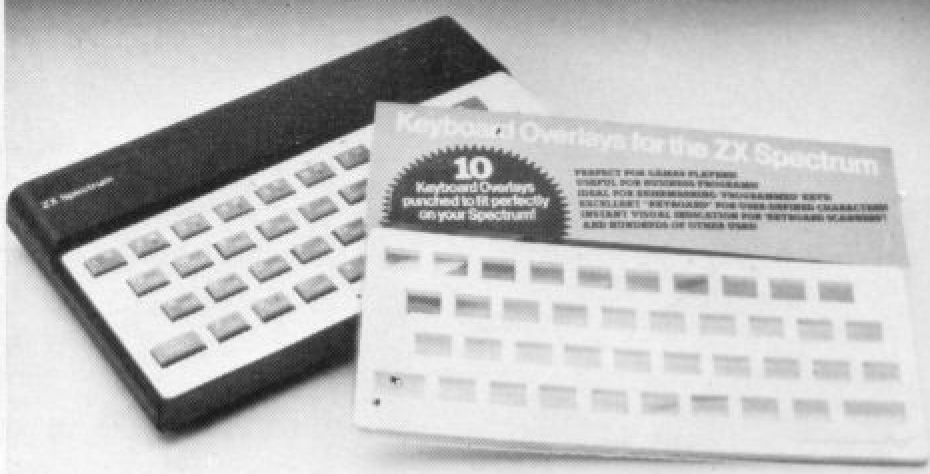
"NOW WHICH KEY DO I PRESS TO SHOOT DOWN THE THING FROM MARS?"

Ever forgotten which key to press when playing a game? Do you suffer from a mind-boggling mass of programmed keys? Do you write programs that use different keys to perform various functions? If so, we have just the thing for your ZX SPECTRUM.

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Just write the function or functions under each key you program and keep the overlay for the next time you play the game. Of course there's lots of more uses you will find for our OVERLAYS, user defined characters, keyboard scanners, mathematical programs, business uses — to name just a few.

There's TEN OVERLAYS to a pack — so you can program with impunity! And they fit perfectly onto your standard ZX SPECTRUM KEYBOARD. Each OVERLAY is printed with the cursor movement key directions and there's room for program name etc.



"ZX81 GRAPHICS BETTER THAN SQUIGGLES AND BLOBS?"

Disappointed with ZX81 Graphics? Perhaps you haven't explored the vast possibilities.

Why not invest in a ZX81 JOTTER, FILM and our guide "ZX81 Graphics programming made easy"?

The JOTTER is a 100 page pad of PRINT grids and PLOT grids with all numbered co-ordinates. The FILM is a re-usable matt transparent polyester version of the grids which can be drawn-on and used again . . . ideal for overlaying and copying.

The 24 page full colour guide will show you how to use the JOTTER and FILM to produce perfect low resolution graphics on your ZX81!

So stop squiggling. Get a set now!

"PRINTER PAPER THAT WORKS? I DON'T BELIEVE IT!"

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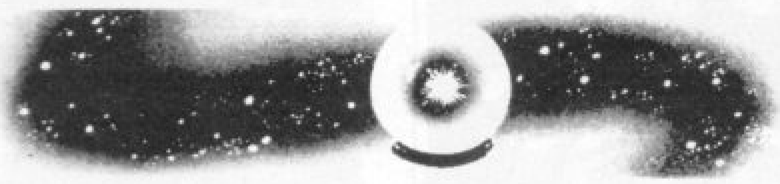
Print'n'Plotter Products

Microdriving lessons taken

IT SEEMS that the much-heralded Microdrive is about to make an appearance. At the same time the first signs of a long-awaited conscience are being seen in the workings of Sinclair Research. Neither has come a moment too soon.

One wonders at what stage of development the drive was when it was announced at the launch of the Spectrum in April last year. Was it only a gleam in Clive's eye with an empty box just for show? We were assured that the box contained something but surely after all this time any such contents cannot have much resemblance to the final device.

Vapourware has been the term coined to describe items which are announced but take a long time to materialise. For



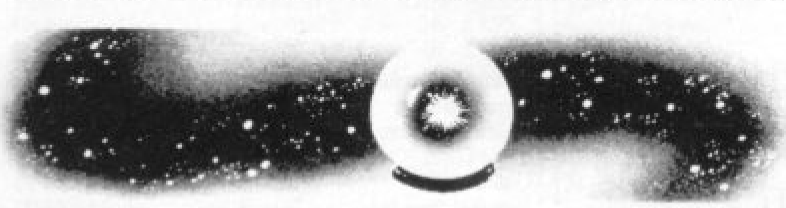
reasons expressed previously vapourware does not serve the consumer very well because of the disruptive effect it has on buying decisions.

Many people have been prompted to buy the Spectrum because of the expected arrival of the extra 100K of memory provided by the Microdrive. How many would have made that decision if they had known the delays they could expect?

This particular piece of vapourware cannot have served the researchers at Sinclair very well either. To announce a product with fairly tight specifications for price and size places a restriction on much of the possible movement in finding solutions to possible problems. That must have aggravated delays once any problems arose.

If that was an isolated incident in a generally satisfactory record for Sinclair Research, it would not perhaps matter too much. After all, if the drive were to appear sometime in April or May, it will be only four months after the first projected deadline. It is not isolated, though.

Include with this the announcement of the upgrade facility. This magazine and many other people were under the impression that the service had been available from the launch. Also



include the move into telesoftware. The plans to produce an adaptor and provide software via the Prestel service, announced last autumn, have now fallen into abeyance. The intention is still to move into that market at some time but no firm date has been fixed.

It is just as well that Micronet 800 does not suffer from the same problems, or Sinclair users might never have been able to take advantage of the benefits of linking-up through the Prestel system.

Add the problems with the Spectrum delays last year and you have a company which not only is working at the limits of technology but also at the limits of credibility. Users may be willing to accept a great deal in the cause of home computing but even they are upset when they are disappointed repeatedly.

As more and more people acquire the Sinclair habit, fewer and fewer will be willing to tolerate the problems suffered by the pioneers.

Thankfully it seems that the message is being understood at Sinclair. In the words of managing director Nigel Searle: "We have learned from our experience." Questioners on future products will now be given few details and no estimate of dates.

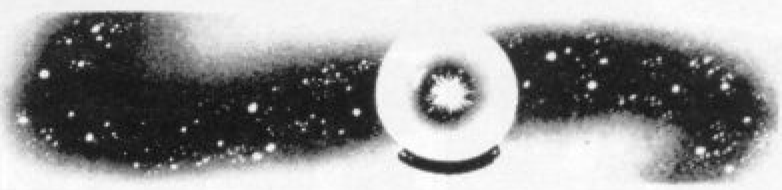
That may be bad news for we who thrive on information about new products and predicted and missed launch dates but consumers will know better where they stand.

In future it should be as difficult to receive an early warning of new products as it has been to learn about the workings of the Microdrive.

No doubt there will be the usual rumours, informed guesswork and unofficial leaks to help maintain interest in what can be expected from Sinclair Research. The company, however, is determined to remain quiet until it feels that it has something worthwhile to say.

That determination extends to the United States and developments by Timex. According to Sinclair it knows nothing of the TS1500 although the plans for its production appear to be at an advanced stage. It could be that Sinclair is thinking of putting it on the British market before the end of the year.

The company is backing its new-found concern by conducting a series of exercises designed to recompense further the early sufferers of the Spectrum delivery problems. They are to



be given the opportunity to be the first to take advantage of the upgrade to 48K and the Microdrives when they appear. Free cassettes and special offers are also being made.

That means that anyone who had to suffer Spectrum delivery delays will have been given preferential consideration on a number of products, the chance of free cassettes and special offers on the printer and printer paper. That might cheer many people but most of them would have preferred the machine on time and in working order.

Which introduces another point. It is to be hoped that after all the ballyhoo, missed launch dates and a Road-to-Damascas conversion, the Microdrives work when they arrive. It would be the last straw for many customers if the drives, in whatever form they take, fail to produce what has been expected of them.

To finish on a light note, it is to be hoped that the people working on the drives in Cambridge have what they expect from the new facilities in Willis Road. The conditions during a Press visit to the stainless steel palace did not augur well.

While Nigel Searle was being questioned about the Microdrives and other associated matters, the room temperature rose gradually. Despite the latest chip technology, which was supposed to control the environment, the atmosphere deteriorated rapidly with some well-lunched journalists beginning to have difficulty keeping their eyes open.

An old-fashioned remedy was tried — the window was opened. Back to the drawing-board.

You'll find a complete spectrum of software at W. H. Smith.



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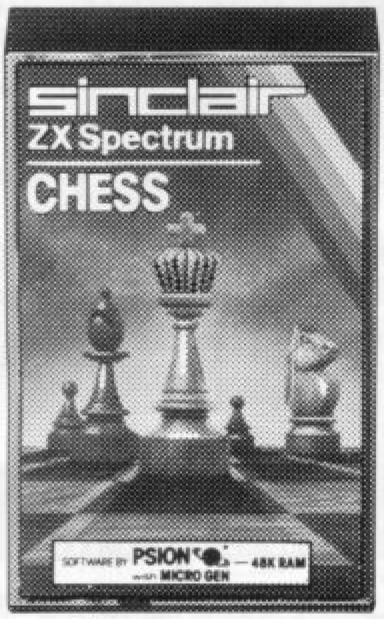
The range of software available for the Sinclair Spectrum is to say the least, extensive.

So every month at W. H. Smith, we review the range with particular reference to presentation, challenge, excitement and value for money. And because we're quite severe it's a difficult job finally to arrive at a Top Ten. But as you can see, not impossible.

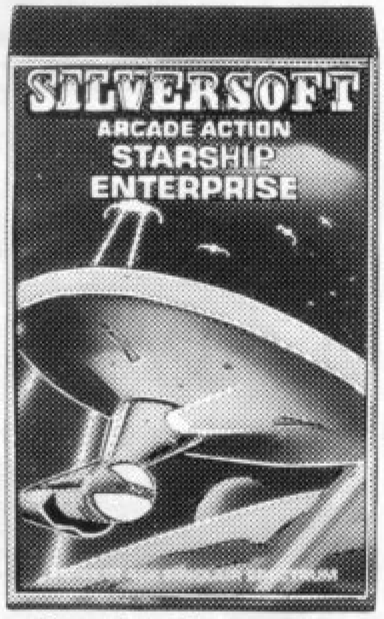
You don't have to take our word for it.

At W. H. Smith we stock the widest selection of Spectrum Software, so you can judge for yourself.

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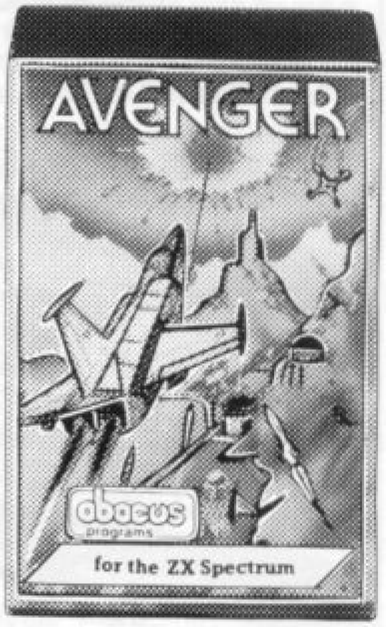
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Backgammon	C P Software	48	£5.95

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Program Collections			
Shiva Special 1	Shiva	16	£5.95
Over The Spectrum 1	Melbourne House	16	£5.95
Over The Spectrum 2	Melbourne House	16	£5.95
Over The Spectrum 3	Melbourne House	16	£5.95

WHSMITH

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We link top-class hardware with value-for-money cassettes to help members to get the most from their machines

Discount on 'outstanding' Digital Tracer from RD

WE DESCRIBED the RD Laboratories Digital Tracer as "one of the most outstanding achievements in the graphics field" in the March issue of *Sinclair User*. Now User Club members can take advantage of the discount price at which we offer this superb piece of equipment.

It is possible for the user to create spectacular screen displays using the device. Diagrams, maps and even photographs can be outlined using the arm of the tracer. The results are transferred to the screen using an analogue-to-digital converter and some software in the Spectrum.

Three-dimensional effects can also be created and user-defined graphics and text can be incorporated into the design. The device will turn the user into an instant computer artist.

Those digital masterpieces can be SAVEd on to cassette and recalled using the software provided by RD Laboratories.

The normal retail price of this innovation in technology is £49.95 but we offer it for £45. The offer, of course, is open only to club members.

Pimania, from Automata, is a game about which all Sinclair owners must know by now. This is your chance to buy the game which could win you the Golden Sundial of Pi. That was the first piece of good news. The second is that we can offer this massive adventure at a greatly reduced price.

The Spectrum version is available through the normal mail order outlet for £10 but we are offering it at £8. The 16K ZX-81 version is normally £5 but our reduction makes it £4.

The Bobker range of cassettes includes a mammoth seven games on one tape, a spy protection tape and a data file for serious use. Again there are substantial savings to be made on these tapes. **Adventure** is reduced by £1 and **List File** by £2.

New members can take advantage of these offers before their memberships are processed by including orders with membership forms.

RD Laboratories, 5 Kennedy Road, Dane End, Ware, Herts. SG12 0LU.
Automata, 65a Osbourne Road, Portsmouth, PO5 3LR.
G A Bobker, 29 Chadderton Drive, Unsworthy, Bury, Lancs.

	List price	Offer price
RD Laboratories		
Digital Tracer	£49.95	£45
Automata		
Pimania (48K Spectrum)	£10	£8
Pimania (16K ZX-81)	£5	£4
G A Bobker		
Adventure (7 in 1) (Spectrum)	£6	£5
Spy cassette (Spectrum)		£2
List File (Spectrum)	£10	£8

Cassette is popular

THE USER CLUB bi-monthly cassette has proved to be extremely successful. The club attempts to present as wide a range of programs as possible. So far, it has included games, utilities and educational programs. In addition, there is a series on Understanding machine code, backed-up by the telephone help line. Usually, three of those categories are covered in each issue.

Members are invited to submit their software and the club pays for the use of any which is suitable. Some very interesting educational programs have been submitted by Jeff Webb, a primary school teacher who is very interested in educational use of the Spectrum. Because of his profession it is its use in the classroom rather than the home which holds his main interest.

He feels there are three areas of application for the computer in the classroom. The first is in teaching the awareness of the computer, its uses, abilities and limitations. The second area is in

continued on page 10

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name ....
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Which computer do you own?
ZX-81 ☐ Spectrum ☐

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Cheques should be made payable to Sinclair User Club.

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using the computer interactively, with the children experimenting within a model or simulation. The computer should become part of everyday equipment in the classroom, like a weighing machine or a tape measure.

Last, it can be used to assist the teacher in any area of the curriculum where other materials have failed or need reinforcement.

The programs Webb submitted illustrate those views. We also believe that educational programs should be interesting and well-presented and his certainly qualify for that category, as we are sure all club members will agree, and we hope he continues to produce them.

The Sinclair User Club

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh ZX Users' Club: J Palmer (031 661 3183) or Ken Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80-81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80-81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX-Computer Centre: Keith Archer, 17 Sweeting Street, Liverpool 2.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

National ZX-80 and ZX-81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80-81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield ZX Users' Club: A W Moore, 1 Ketton Avenue, Sheffield S8 8PA, Yorkshire. Annual subscription 10, monthly newsletter and cassette.

Sittingbourne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Stratford-on-Avon ZX Users' Group: Chris Parry, 16 Sackville Close, Stratford-on-Avon, Warwickshire.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworthy, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium: ASBL BDMA Belgium National Sinclair Club; P Glenisson, Rue De l'Epeestraat, 14, 1200 Bruxelles.

Belgium, France and Luxembourg: Club Sinclair, Raymong Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468).

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.

J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jencyzyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Italy: Sinclair Club, Vie Molimo Vecchio so/F, 40026 Imola, Italy.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

South Africa: Johannesburg ZX-80-81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.

Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).

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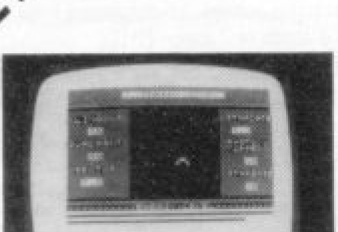
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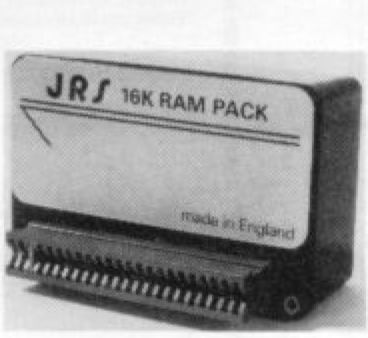
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Trade group suggested

THE FORMATION of a trade association of software houses may not be far away. Many companies are beginning to see a need to pool resources and to standardise opinions on such issues as software libraries, piracy of software and trade links overseas.

The man behind the attempt to form the group is Robert Brenchley, of R and R Software. He says:

"At the moment there is a good deal of apathy in the industry. People are interested in forming a group but they do not have the time to do so."

Finding the companies willing to enter a group is not the only difficulty being experienced by Brenchley. "We are looking for a president who will chair meetings. That has proved the major sticking-point. It is best to have someone who is an independent and unconnected with any of the member companies."



MIKE JOHNSTON
Possible president

Several people have been suggested for the chairmanship. Mike Johnston, organiser of ZX Microfairs, is one who has been asked. Brenchley is also in contact with Dr Ian Logan, author of several books on Sinclair machines. He says:

"Logan is ideally suited for the job. He is well-respected in the software market and is an authority on Sinclair machines."

The association is still only an idea of Brenchley's but he hopes software manufacturers will contact him to discuss the subject.

Microdrives expected to be launched soon

SINCLAIR RESEARCH refuses to give a date when the long-awaited Microdrive is expected to be available. It is understood, however, that production was to begin before the end of April. Managing director Nigel Searle said:

"We have learned from experience not to give launch dates until we are sure. We cannot say when the Microdrive will be available."

He added that development was at a late stage with the custom-designed chips having been sent to a semiconductor manufacturer.

As a way of thanking people for their patience with the company in the last year, the first Microdrives will be available only to customers who ordered Spectrums before they were being sold retail last October.



NIGEL SEARLE
'Development at late stage'

"We are particularly concerned about all the people who were inconvenienced by having to wait so long. We think they should be given the opportunity to buy it first," Searle says.

The price of the drive is expected to be about £40, with another £30 for the interface which will allow up to eight drives to be attached to the Spectrum. The interface will also permit an RS232 printer to be added.

Searle says the drive will contain a removable "element" — as *Sinclair User* revealed, a floppy tape — which will be made available to software houses so that pre-programmed "elements" can be sold in the same way cassettes are sold at present.

Coursing

A NEW SERIES of courses for Spectrum owners who would like to learn more about their machines will be launched in August.

The courses are non-residential and will take place on the Wirral. There is room for 20 students and you do not have to own a Spectrum to join.

The courses cost £35 and each student will be provided with a machine. Further information from Mike Hare, 12 Prenton Farm Road, Birkenhead, Wirral.

Spectrums for export

THE SPECTRUM is entering the export market. By the end of April it was expected to be on sale in 30 countries.

Initial sales of 15,000 a month are anticipated, rising sharply throughout the year. Large advance orders have already been received from South America and the Far East but the company is concentrating first on European markets. Eventually it is hoped to open new markets in the Middle East and the rest of the third world.

Upgrades offered

OWNERS of the 16K Spectrum can have their machines upgraded to 48K by Sinclair Research for £60. It involves returning the machine to Sinclair, which then upgrades the chips on the PCB.

It was announced that the facility would be possible when the Spectrum was launched a year ago but it has only just become available.

To ensure fair treatment, the company is making the service available in order of purchase and has already written to people who bought the machine early last year. No orders can be taken at present from more recent buyers.

People ordering the upgrade are being offered a free Sinclair 48K cassette of their choice and the chance to buy the ZX printer at a special price of £39.95 against the usual £59.95.

Sinclair drops telesoftware

SINCLAIR RESEARCH has dropped plans for a Prestel/Micronet adaptor for the Spectrum. The company has split with Martochoice, which won a competition run by British Telecom last year to design a cheap Prestel interface for the ZX-81.

The company was co-operating with Sinclair Research, which was to manufacture the device.

Nigel Searle, managing director of Sinclair Research, says its plans for telesoftware are "now in abeyance". He says the company is still interested in the transmission of software over telephone lines but he could not say when it would renew its involvement.

Martochoice would not comment on its dealings with Sinclair Research regarding the adaptor.

Despite these problems Micronet 800 still plans to launch its Spectrum adaptor on May 1.

Plans for T/S1000 upgrade

TIMEX is planning to introduce a new Sinclair/Timex machine to the American market in the near future. It will be an upgraded version of the T/S1000, of which Americans have been critical since it was introduced last year.

The T/S1500 will be introduced on June 1. It will have a regular typewriter-style keyboard with movable keys and also an on-board 16K RAM.

Timex claims that the machine will have the simplicity of the T/S1000—ZX-81 look-alike—and will retail for approximately $100. Timex says that the new keyboard and 16K RAM are free add-ons.

Sinclair gets young award

CLIVE SINCLAIR has been named Young Businessman of the Year by *The Guardian*. The award is made for the thirteenth time and goes to the person who has made the most significant contribution to business.

The award was presented at a Mansion House luncheon in March.

Timex/Sinclair User for States

A NEW MAGAZINE for the owners of Timex/Sinclair machines in the U.S. has been launched by ECC Publications, the publishers of *Sinclair User*.

Timex/Sinclair User was launched in April and includes much the same mixture of reviews, projects and articles for which *Sinclair User* has become known.

Terry Cartwright, managing director of ECC, believes that there is a massive market for the magazines in the States. He says:

"There are three-quarters of a million Timex/Sinclair machines there at the moment and we expect it to grow to two million in the next year."

The print run on the first issue of the magazine is 100,000 copies, a large amount by any standards for a new magazine. Cartwright is confident of a massive response.

The first issue includes hardware reviews, book reviews, how to build your own EPROM blower and a four-part series on programming in Basic.

The American magazine has a separate editorial and advertising staff but members of the British *Sinclair User* team have been in the U.S. to co-ordinate the launch. They include John Sterlicchi, who acts as editor-in-chief, and John Ross, advertisement manager of *Sinclair User*.

Readers of the British *Sinclair User* may subscribe to the new magazine. Anyone wishing to do so should write to *Sinclair User*.

Handicapped microfair

A MICROFAIR with a difference is being held in September. It is called Electronic Aids for the Handicapped and is funded by the Department of Industry.

The exhibition will be mobile and will try to show what is being done in the field of microelectronics to help disabled people.

For further information, contact Ed Wilson at the Handicapped Persons Research Unit, Newcastle-upon-Tyne Polytechnic, No. 1 Coach Lane Campus, Newcastle-upon-Tyne NE7 7TW.

Pretorious Systems is almost bankrupt

SEVERAL months ago *Sinclair User* contained advertisements on behalf of Pretorious Systems, a manufacturer of ZX-81 RAM packs. Some readers have experienced problems with the firm, which is run by R U Ekam.

Ekam has stated that both he and his business are almost bankrupt and that he is no longer trading. *Sinclair User* has pursued the matter and has taken what steps it can to prevent Ekam from trading. The advertising department can now assure readers that no more advertisements for Pretorius Systems goods will appear in the magazine.

The magazine suggests that readers have no dealings with Pretorius Systems in future.

TOP TEN

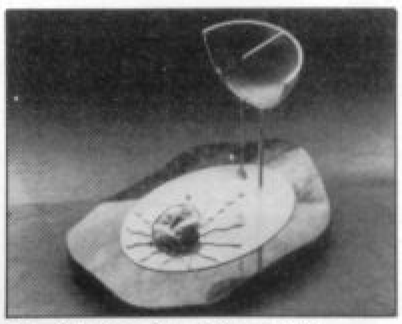
Program	Company	Machine
1 The Hobbit	Melbourne House	48K Spectrum
2 Black Crystal	Carnell	48K Spectrum
3 Time Gate	Quicksilva	48K Spectrum
4 Vu-3D	Psion	48K Spectrum
5 Flight Simulation	Psion	48K Spectrum
6 Penetrator	Melbourne House	48K Spectrum
7 Hungry Horace	Psion/Mel House	48K Spectrum
8 Avenger	Abacus	16K Spectrum
9 3D Tanx	d'Ktronics	16K Spectrum
10 Football Manager	Addictive Games	48K Spectrum

Compiled by W H Smith, Microware and Buffer Micro Shop.

Chasing Pimania

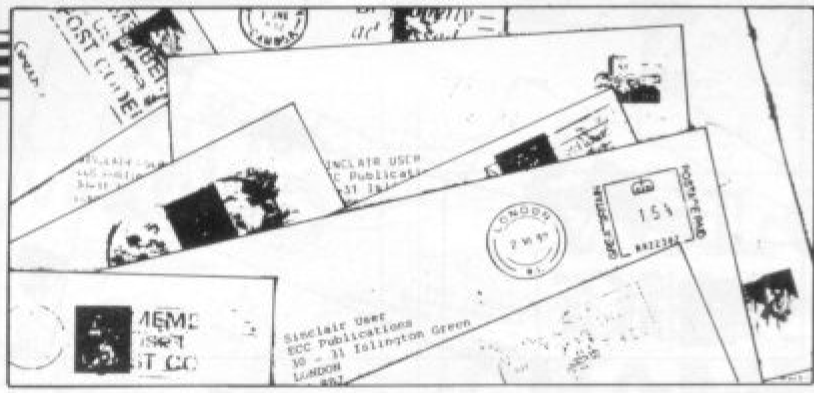
AUTOMATA is still looking for a winner of its adventure competition, Pimania. The prize is a golden sundial and to win it you must finish the game. Automata says that no-one has managed to do so and will not even reveal if anyone has been close to winning the prize.

Neither has a winner been found for the Krakit competition being run by Artic Computing in conjunction with International Publishing and Software. The prize is £10,000 if you can answer the questions posed on the Artic Krackit tape.



The Golden Sundial of PI

The PSS competition also closes this month. The company is looking for a good program written using a Spectrum or ZX-81 compiler. The winning program will be marketed by PSS.



Competition suggestion

WHILE VISITING computer shops and watching very young children enjoying using computers, I am often amazed how clever many of them are at programming.

We have national and international competitions for chess, snooker, darts and sports but nothing yet in the computer area. Can I suggest you consider a national and perhaps later an international computer competition for different age groups? I am sure it would arouse interest.

Chris Leslie,
Harrogate.

Minotaur problem

I WOULD like to point out that an error has occurred when my Minotaur program was re-typed for listing in the March edition. In lines 90 and 100 a space was inserted instead of an inverse space. That results in failure to form the vertical borders of the maze and when the program is run the Minotaur promptly walks off the edge of the display, causing a crash. The lines should read:

```
90 LET M$(M+1,1)="■"
100 LET M$(M+1,31)="■"
```

Kevin Tutte,
Walmley,
Sutton Coldfield.

Discrepancy in routine

WE MANUFACTURE computing hardware and accessories and are investigating the usefulness of the Spectrum for an application which we are considering. We have found some discrepancy in the non-maskable interrupt routine which may be accidental or intentional. We give the details:

```
NMI Routine
$66 push af
$67 push hL
$68 1d h1, (NN)
$6B 1d a,h
$6C or 1
$6F jp (le)
$70 pop hl                    Jump
$6D jr nz, 1 should be jr z,1
$71 pop af
```

The non-maskable interrupt routine takes the values located at 23728 and 23729 for the interrupt jump. The way in which Sinclair has written the routine it happens only if the contents of the locations is zero, i.e., it will jump to re-set only at location $0000. If the instruction at $6D had been a jrz, D1S (jump on zero) instead of jr nz, D1S (jump on non-zero) then the NMI would jump to any address pointed to by the values at 23728 and 23729, except if that value were zero, when it would be ignored.

We would appreciate your comments and would like to know whether Sinclair intends to correct the problem. Will it mean that all the Spectrums supplied to date will have to be recalled for a ROM change?

S T Currah,
Currah Computor Components Ltd,
Hartlepool,
Cleveland.

● *According to Sinclair Research the observations you make are correct. As it is not an advertised feature of the Spectrum the company has no plans to correct the ROM until a suitable opportunity arises.*

Avoiding bad habits

YOUR ARTICLE on Memory-saving techniques by David Anderson spells disaster to inexperienced programmers. It encourages the misuse of the Basic language.

Those techniques allow for more complex programs to be run when the amount of memory is limited. The programmer is forced to write incomprehensible code. He may continue to write such code when it is not needed and bad habits may set in. The only way to break such habits is by re-training the programmer in the correct use of Basic.

A more acceptable way to deal with a 1K ZX-81 is to expand the memory. It is cheap and easy to do. Alternatively, replace it with a Spectrum which is well worth the extra cost. John Gilbert's programming course is an excellent aid for developing good techniques.

Chris Powell,
Wembley,
Middlesex.

Helping on the farm

READERS may be interested in our experience of using Sinclair computers which refutes the suggestion often heard that they are not suitable for serious use in small businesses. We have been doing the book-keeping for our farm for more than two years on a ZX-80 and are about to transfer to a Spectrum.

We have also written and used successfully Cash-Flow and Crops programs for the ZX-81. Thanks to the East London Robotics Slowloader — announced in your November edition — we have transferred both programs and their data to the Spectrum; the only difficulty was that some of the numerical data was stored in string arrays, to save bytes, using the CHR$ and CODE functions,

continued on page 18

Maze escape blocked

I WOULD like to reply to the letter from Perceval de Montarby in the April edition concerning 3D Monster Maze. From my understanding of the letter, the description violates some of the rules by which mazes are generated. During its writing, 18 months ago, more than 3,000 mazes were mapped. Each complied fully with all those rules. Subsequently, on one occasion, a "great open space in the maze" was consistently but randomly generated.

That was traced to a spurious bit being added to the code, causing the checks to be by-passed. As most ZX-81 owners are aware, it is possible to have an apparently correct load with spurious bits added. On that occasion re-loading at a lower level solved the problems.

The information concerning the whereabouts of T Rex has always been consistent with his relative position and the twists in the maze.

My new company, New Generation Software, has just taken-over marketing of the game and my two other games for the ZX-81. I shall be looking closely at the marketing of the products. I would like to point out, however, that a software house can only recommend a retail price and cannot enforce it.

Malcolm Evans,
New Generation Software,
Bristol.

continued from page 17

but since the ZX-81 and Spectrum character codes are different we had some very strange data at first. When the Microdrive is available we hope to integrate all the programs into a single package costing far less than the systems available at present to farmers.

Both our Spectrums produce a defective print on our printer when the <LIST statement is used. The lowest (6th), line of the printed pixels of each character is printed one or two pixels before it should be. It does not do it on COPY. Has anyone else experienced this? Is the fault in our printer or our computers?

P Banks,
Crows Hall Farms,
Debenham,
Suffolk.

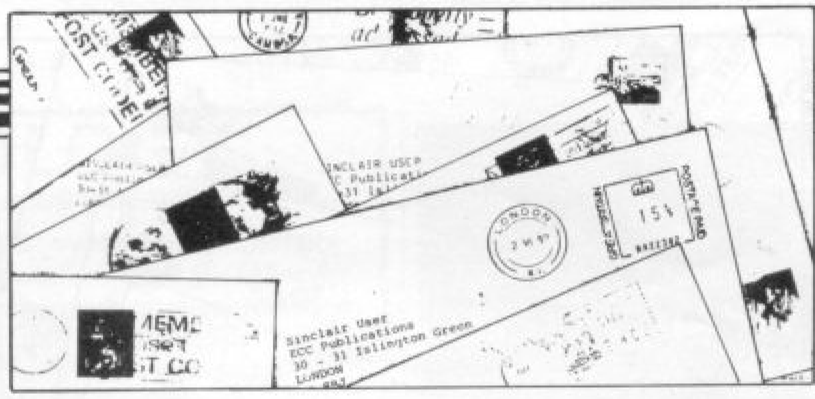
Microfair crush

REGARDING the sixth ZX Microfair, is it not about time that the organisers considered a more spacious venue? The New Horticultural Hall is far too small for such a popular event; in fact, conditions could be better at a local church jumble sale.

After spending about two hours trying to push through a mass of heaving bodies, I gave it up as a bad job. It was very difficult to see what the exhibitors were trying to display and at times the side aisles were practically impassible.

D R Franklin,
Brockley,
London SE4.

● *The organiser says that it is difficult to estimate the numbers likely to attend the fairs. He could limit numbers by increasing admission prices and to choose another bigger, hall would also increase costs. He does not wish to do either, because that would limit the numbers of people and the goods which they were able to see.*



Balancing the model demands

I HAVE been reading *Sinclair User* for several months now and considered it excellent value for money — until the March issue.

The front cover states *Sinclair User,* incorporating *Spectrum User*. From the articles inside it would appear to be *Spectrum User* — incorporating occasional articles for ZX-81 users. That may seem harsh but Software Scene contained eight reviews, all for the Spectrum; Mind Games was devoted entirely to a Spectrum adventure which is not available for the ZX-81.

I know more and more people now own Spectrums but there are still thousands of ZX-81 owners who buy the magazine. So please give us equal rights; we do not want to feel like second-class citizens.

S J Rhodes,
Caddington,
Luton, Beds.

● *We appreciate the difficulties of catering for two very popular machines. The problem with Software Scene in recent months has been the result of the small amount of new software being produced for the ZX-81. We have reviewed more programs for the machine in this issue and intend to give priority to new ZX-81 software in future.*

I AM writing to complain about the lack of 16K ZX-81 programs in your magazine. I know that you have had complaints about the lack of Spectrum programs but that does not mean you have to omit the 16K ZX-81 programs. Perhaps in future you could publish an equal amount of programs for the Spectrum AND 16K ZX-81?

D Windsor-Martin,
Cheltenham, Glos.

AFTER buying the February issue I felt compelled to write to ask you why the cover price has risen by 15 pence.

I would like to ask you if it is possible to include more 1K ZX-81 games programs.

Martin Betts,
Eastbourne,
East Sussex.

● *With a limited amount of space it is impossible to keep everyone happy but we are always aware of the situation and will attempt as fair a balance as possible.*

Spectrum issue clues

COULD you tell me how to determine whether my 16K Spectrum is an Issue 1 or Issue 2 computer? I wish to update to 48K in the near future and all the advertisements in your magazine indicate that one must specify whether the Spectrum is either Issue 1 or 2.

I have read your magazine since its July issue and have been greatly impressed with the ever-improving quality of your program pages. Well done and thank you very much.

Mark Staniford,
Liverpool College,
Liverpool.

● *A resistor has been omitted from the new issue two board. Also the circuitry on the PCB is all on the board and there are no protruding wires as there were on issue one. If you look through the back slot of the Spectrum and everything is reasonably flat on the PCB you have a model two. If, however, you can see wires leading from the board you have a model one.*

Amplifying sound

I OWN a Spectrum but I find one of its main flaws very irritating. I have discovered how to amplify the sound through the cassette recorder.

The EAR and MIC plugs should be plugged into their places on the computer. The other EAR socket should be plugged into the MIC socket of the cassette recorder. The cassette recorder should then be set to PLAY then paused via a PAUSE button. If the cassette recorder has a PA system the sound can be amplified to unbelievable heights.

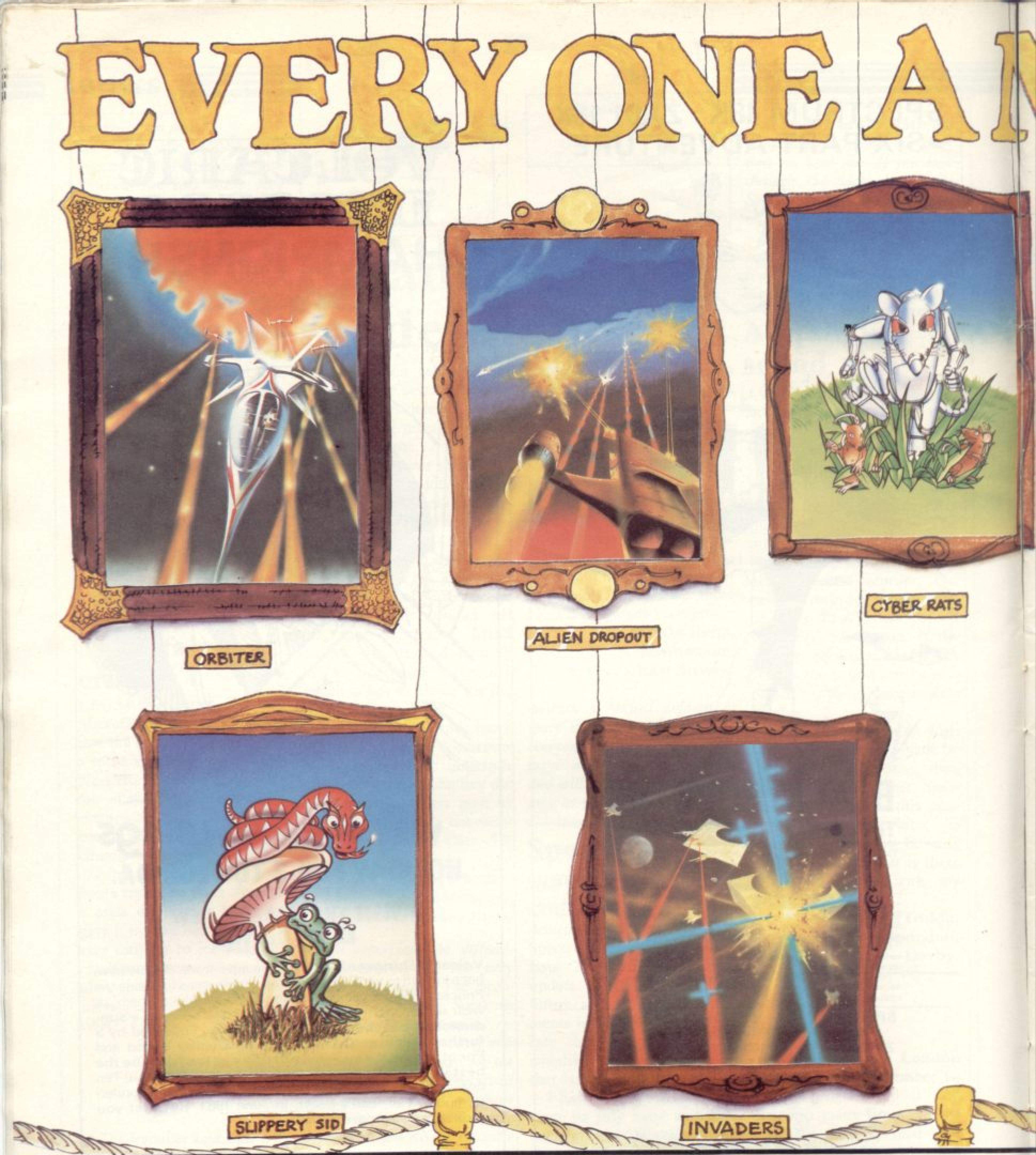
One sound I have no wish to amplify is the one made by the AC adaptor when plugged in. Do other Spectrum owners have this constant buzzing which is audible over the low buzzing of the Spectrum? Or is there something wrong with my AC adaptor?

Sarbjit Gidda,
Spondon,
Derby.

Bridge record

AFTER I had seen **London Bridge** in the December issue, I programmed it and played it many times. In the February issue I read that Owen Nurse had scored a total of 2,050 on the game. That made me determined to improve on that score and I reached 500 more, i.e., 2,550 with three bricks remaining. I am nine, one year older than Owen.

Paul Murray,
Newton Aycliffe,
Co. Durham.



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Spectrum can now link to Centronics

LPRINT is not only a Sinclair keyword but the name of a printer interface for the Spectrum. The small black box, 2½in. by 2in., plugs into the expansion port on the Spectrum. Thereafter all LLIST and LPRINT commands are converted to a Centronics parallel interface on the back. By plugging-in a standard 20-way cable to its pins a standard plain-paper printer can be used.

Any Centronics printer can be used, as any graphics, user-defined characters and the like have to be programmed in by the user — each printer has ways of doing graphics and special characters. The instructions are so simple that they are printed on the bottom of the unit.

The same firm can also supply a tape with a program for using the COPY command. GP100 was used to reproduce every dot on the screen using a routine of only 76 bytes stored above RAMTOP.

A modification must be made before using LPRINT, as the printer would normally output a new line after every carriage return — ENTER — character. That facility must be removed so that it gives a new line only when the printer interface tells it to do so. The printer manual will undoubtedly cover that and there is a warning built into the COPY program. Sometimes all that is required is to throw a switch or insert a wire between two terminals.

The LPRINT graphics routine for COPYing the screen is its best feature. Its worst is that you cannot set the line length on LLIST, so it prints the line until it reaches the end of the line or exceeds the length of the printer paper.

The other thing about LLIST and LPRINT is that it ignores graphics and other non-recognisable characters. So a string with three graphics characters will print as an empty string — no spaces. It would be much better to print a space so that the graphics could be filled-in later by hand.

All the control for the printer is stored in a 2K ROM inside the box along with seven ICs. No user RAM is used unless the COPY command is required.

The LPRINT module costs £41.40, plus the printer cable at £12.08. The COPY tape costs £5. Euroelectronics is at 29 Clarence Square, Cheltenham, Gloucester. Tel: 0242-582009.

Printer improved

THE ZX Printer Spool solves a problem which bedevils Sinclair users. The aluminium spindle and two end-pieces are fitted to the paper roll and allow it to turn easily. The plastic ends on the printer are often loose and cause it to wander from side to side, preventing the printer motor pulling through the paper.

It solved the problem but only after tapping one end of the paper reel on a hard surface to get it back into line.

The results are much better printout both for graphics and text, plus a great saving in printer paper.

The ZX Printer Spool costs £4 and can be obtained from Sadlers Developments, Sadlers, Vicarage Lane, Send, Woking, Surrey GU23 7JN.

Kit prevents the wobbles

ADAPT ELECTRONICS has produced a RAMLOK kit to prevent the Sinclair RAM pack wobbling on the ZX-81. It consists of a female edge connector plug which has to be soldered on to the expansion port of the ZX-81 and a mounting bracket which is attached to both the ZX-81 and the RAM pack by double-sided sticky tape.

There are two plastic blocks included in the kit, one for the Sinclair type and one for other types. The two pads stuck on to the ZX-81 have holes so that a steel pin can bolt all three blocks together firmly. The RAM pack can be the only item used on the back of the ZX-81 but you can detach it by removing the pin. The edge connector is gold-plated to prevent corrosion.

The system seems to work well but does not allow for the printer or any other device to be used. It also invalidates your Sinclair guarantee. If you have that problem and you want to use only the RAM pack the RAMLOK kit costs £8 from Adapt Electronics, 20 Starling Close, Buckhurst Hill, Essex IG9 5TN. Tel: 01-504 2840.



Atari joystick interface

AGF has now modified its joystick interface to accept standard Atari joysticks. The interface allows you to simulate the cursor keys on a Spectrum or ZX-81 plus a second set of keys for a second player.

Much software uses cursor keys and AGF provides some demonstration software with

continued on page 24

continued from page 23

each unit so you can look for the cheapest joysticks which can be used on Ataris — there is a range from Le Stick to Competition Pro.

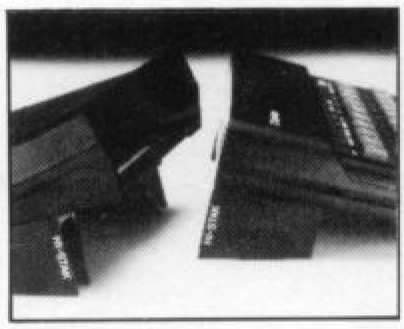
AGF sells the interface at £20 and the address is 26 Van Gough Place, Bognor Regis, West Sussex PO22 9BY. You should indicate which machine you have.

Telford offers ZX-81 upgrade

FOR £42.40 Telford Electronics and Computing will fit your ZX-81 into a Fuller 42-key keyboard and case. It will also add reverse video switch, re-set button, repeat key — on a separate key — and power-on LED. The price includes fitting and postage.

Optional extras include a monitor socket, joysticks and fitting the power pack and 16K RAM inside the case.

For more details, contact TEC at 26a Bradford Street, Shifnal, Shropshire TF11 8AU. Tel: 0952-46008.



Better angle on Spectrum

WARP FACTOR EIGHT sells the Hi-Stak, plastic blocks to raise a ZX-81 or Spectrum to an angle suitable for typing. They raise the Spectrum by about 30 degrees and stick on the bottom of the case at the back by double-sided sticky pads. They are a little expensive at £3.95 inc. VAT and postage but if you want to have style and do not wish to add anything at the back — the edge connector finishes 1½in. off the table and can cause wobble — use it.

Warp Factor Eight is at 6 Pelham Road, Braughing, Ware, Herts SG11 2QU. Tel: 01-452 7782.

Easy-to-use printer link

KEMPSTON MICRO-ELECTRONICS has produced a Centronics printer interface which plugs on the back of the Spectrum. There is nothing spectacular in the box as it is an 8255 chip used as a port to access the printer cable.

The printer cable is a full 35-way type and is about one metre long. The plug at the end which fits on the printer seemed a little too thick to put the securing clips around but it was a tight fit in the socket.

All the hard work is done in 650 bytes of machine code stored above RAMTOP; a different program is provided for each computer. That may seem a great deal but the accompanying Basic program allows you to specify a number of options on the printer. Once those options are set, the program will save the machine code only to allow you to use all the rest of the RAM yourself.

Line length, changing the character codes for individual characters, special features such as the line feed and carriage return, can be set in software. All those commands affect only LPRINT and LLIST as COPY is ignored.

Any of the options can be ignored by pressing ENTER in response to the question. In that way a printing routine can be personalised and if, say, the line length is limited to 32,LLIST would produce a duplicate of that listed on the screen.

Hilderbay, the company which produced the software, must be congratulated on providing a fine, easy-to-use piece of software.

The only way to COPY a screen suggested in the instructions is to use the Basic Point command in a loop to assemble the required graphic bytes to put out to the printer. That is useful but slow and the routine applies only to Epson printers. Looking through the printer manual is the only answer if you do not have one of those.

A machine code program for at least two of the popular printers to simulate, if not use the COPY command, would have been useful. That seems preferable to the LPRINT, is it allows you control of the printer with as much ease as possible.

The printer interface costs £45 and is available from Kempston Microelectronics, 180a Bedford Road, Kempston, Bedford MK42 8BL.

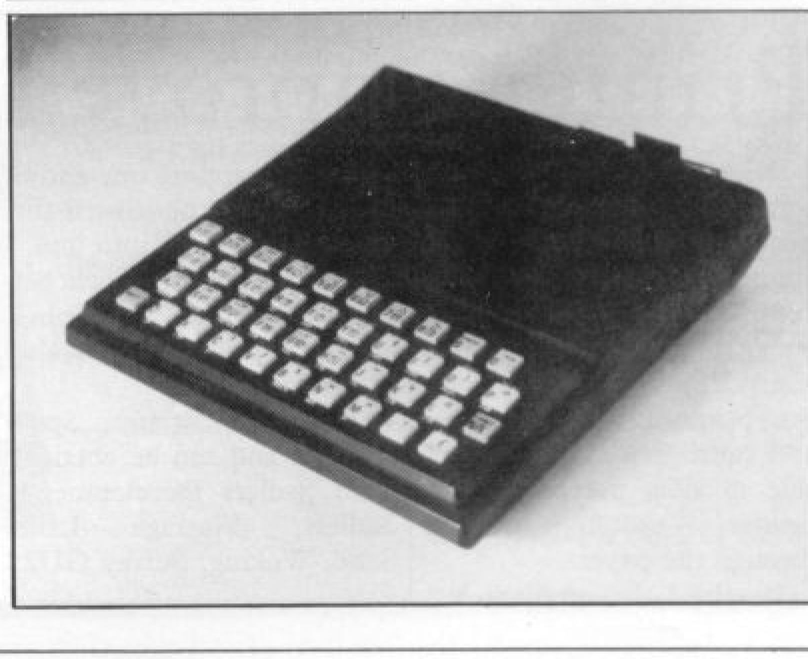
Cheaper keyboard

THE FILESIXTY button set is cheaper than a real keyboard and yet offers the same advantages. The keys move and the Sinclair keyboard has a positive keypress. The button set is the same size as the Sinclair keyboard and is stuck over the top of it with double-sided sticky tape. It does not invalidate the guarantee, require soldering, or need you to go inside the case.

The buttons have on the underside a nylon flap with a knob on it. The knob is centred over the Sinclair key and when not being pressed holds the button above the keyboard. When the button is pressed the key moves down about 2mm. and the knob strikes the keypad. That works very well.

The keyboard has a black surround to blend with the ZX-81 and the keys are nearly all white with black lettering, making them easy to see. The number keys are coloured blue, SHIFT and NEW LINE keys orange. The keys are only 8mm. square, which makes them easy to use.

The graphics on the keys, however, have been changed, so that solid blocks of black are represented by lines indicating the area covered. That and the fact that some of the key symbols have been changed may create initial difficulty, but should be no problem after use for a week or so. The cost of the Filesixty button set is £10 and it should last as long as the Sinclair keyboard. Filesixty can be obtained from Fox Electronics, 141 Abbey Road, Basingstoke, Hampshire RG21 9ED and some shops.



Success in the stars for Steller

THE PATTERN of the stars of destiny looks good for Steller Services which is producing computer programs for the Spectrum and ZX-81 to help budding astrologers. The first cassette in the series calculates ascendant, midheaven, planet positions and planetary aspects using the equal house method, which is common in the world of astrology.

The chart can be constructed with a fair degree of accuracy for any time and any place in the world.

Accuracy is something the author of the program is trying to improve all the time. For that reason the program has been amended several times, although users are welcome to talk to the company and the after-sales back-up is good.

The company claims that several professional astrologers are using the program to make the drawing of charts for clients faster and more accurate. The program is not a toy and anyone who buys it for a party gimmick will be disappointed.

The good-quality program will work wonders for those who put their faith in the stars. It is available from Steller Services, 8 Fir Tree Vale, Leeds LS17 7EY. It costs £10.





Plenty of 1K action

FIGHTING space invaders, being a spacefighter pilot and zipping around a Pac-man maze are just three of the delights on the Micromega **Arcade Action** cassette for the 1K ZX-81.

There are five games on the cassette. The first is **Overtaker.** The title gives a clue to what you have to do. You are a racing driver and have to overtake the slower cars on the track. The speeds your supercharged car can attain are amazing, even if you take into account that the program is written in machine code.

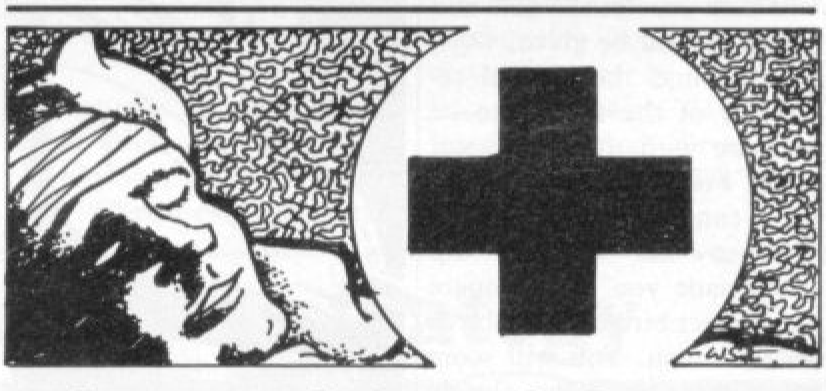
The second game is **Missile Man.** You are in charge of a missile battery in space. With your weapons you must destroy the usual enemy invaders. **Spacefighter Pilot** is the third game on the tape. You must protect your mothership from enemy guns which are firing into space from the planet surface below.

Pac-man had to poke its nose in somewhere. **Greedy Gobbler** is the fourth in the series. The controls are difficult to master, as they are set out like a keyboard joystick. When your fingers are positioned on the keypad defined by the program you will have difficulty in hitting the start key.

The final program is named after a rather too-well-known alien, **Extra Terrestrial.** The aliens may seem like ETs but they are intent on destroying a map of the world. The unnerving thing about the game is that you are the nasty alien but if you are of a sadistic turn of mind you may derive some pleasure from the destruction.

Arcade Action is excellent value. It can be obtained from Quantec Systems and Software Ltd, 230–236 Lavender Hill, London SW11 1LE. The cassette costs £4.95





First aid tuition

THE SINCLAIR computers are ideal machines for displaying information to adults as well as children. **The First Aid Program** for the 16K ZX-81 gives the user a self-help course on how to save a life, or how to try to prevent death.

The tuition is given by an animated character who appears at the beginning of the training session, called First Aid Bill. He asks how you would cope with an emergency. When you have failed miserably on that part of the program, Bill will give you a guided tour of the principles of first aid and how to recognise the danger signs in an accident victim. That is the first choice on the main menu shown by the program and takes about 15 minutes.

The other options include a section for revising a part of a subject under such headings as shock, suffocation and broken bones. The list of subjects for revision is very comprehensive.

When you feel confident you can take a test. The computer quizzes you and you can reply, using one or two words as a minimum answer. The computer seems intelligent and understood most of the answers we entered.

First Aid costs £9.95. It is available from Network Computer Systems Ltd, 39 Bampton Road, Luton, Beds.

Good Amba trio

TRIAD is not an ancient oriental sect; it is a series of three games for the 48K Spectrum. The difference between this cassette and others of its kind is that all three games are included in one program and each of the games would sell separately if the manufacturer decided to do so.

The first game is as original in its title as it is addictive in its playability. It is called **Snackman** and, as you have probably guessed, you take the part of a little creature with a big mouth which eats its way around a maze while being pursued by a variety of ghosts.

The ghosts in Snackman are very intelligent and very fast. If you make one mistake you are dead.

The second game is **Sub Track.** We reviewed it last month as Amba Software has produced it separately so that 16K Spectrum owners can play it. It is a good ploy, as many people still have the 16K machine.

The third **Triad** game is a maze quest where you have to move a little man around the maze and pick up the treasure which has been strewn around the tunnels. The game is simple to play and is very addictive. There are various levels of maze and they range from the easy, with few obstacles in your way, to the complicated, with winding tunnels and invisible barriers.

Triad is priced at £9.50. It is available from Amba Software, Freepost, Cambridge CB3 7BR.



Spotting the birds

PROGRAMMERS are going further afield to find uses for the 48K Spectrum. Hilton Computer Services has just launched an 'expert' system, called **Garden Birds.** It will allow budding ornithologists to identify birds they have spotted with a pair of binoculars in a field.

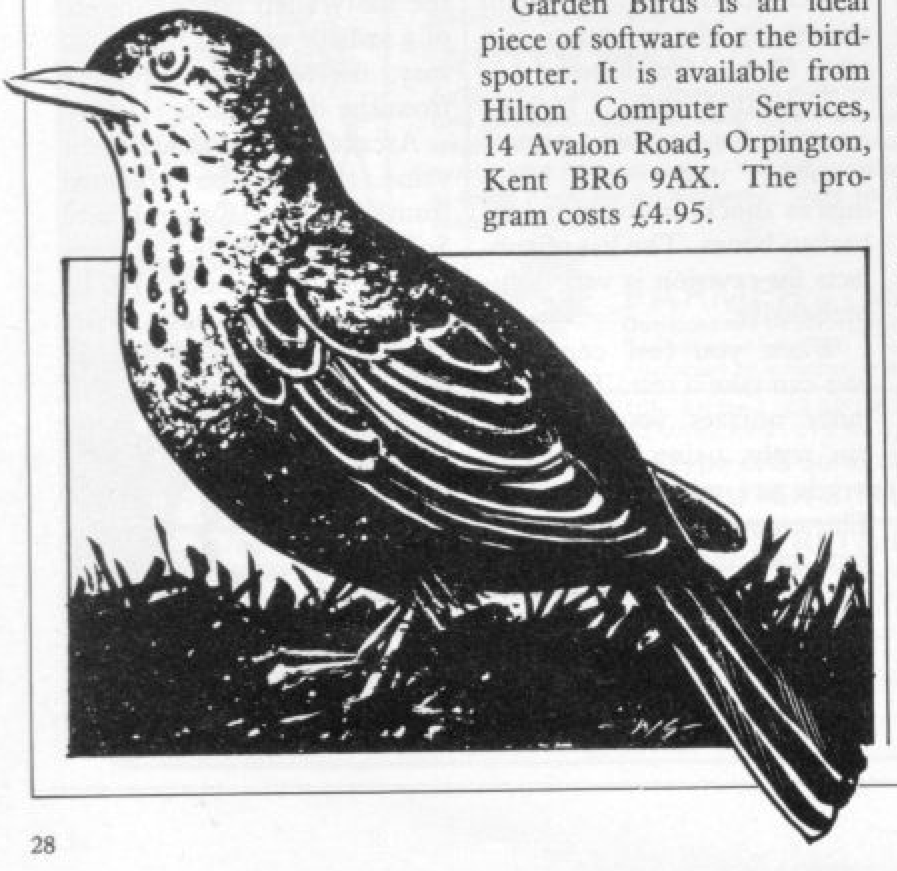
The program starts by giving the country code with suitable and very interesting bird graphics. Then there is a long wait while the rest of the program loads.

When loading is complete, the computer will show the names of the birds in its data bank. The user must then enter the markings and the behaviour of the bird which has been seen. Users must be willing to enter plenty of data, including size, colouring and call sign of the bird. The ornithologist computer will then process the data and a reading will be given.

We found the general reliability of the system to be accurate with the commoner birds. For instance, the computer can spot a blue tit.

When the analysis has been made you can compare the subject bird to other birds on the menu. You will score depending on how closely your subject bird compares to the other birds.

Garden Birds is an ideal piece of software for the bird-spotter. It is available from Hilton Computer Services, 14 Avalon Road, Orpington, Kent BR6 9AX. The program costs £4.95.



Figuring things out

IT IS PLEASANT to see a company which is not afraid to cover a specialised area in the Sinclair market. University Software produces five cassette tapes for students at A level or university standard. The programs are available for the 16K ZX-81 and the 16K Spectrum. Tape one introduces matrix operations. The second explains polynomials. It includes quadratic equations, Newton–Raphson and half-interval search methods.

Tape three deals with integration, using Simpson's and trapezoidal rules.

The fourth tape covers regression. The program can deal with up to 20 independent variables, with standard errors, and also illustrates interpolation.

Tape five concerns linear programming and is capable of handling up to 20 variables and the same number of constraints.

All programs can be bought separately, or as a package costing £30. The first three tapes cost £5.95 and the fourth and fifth £6.95. They are available from University Software, 45C Sloane Street, London SW1X 9LU.

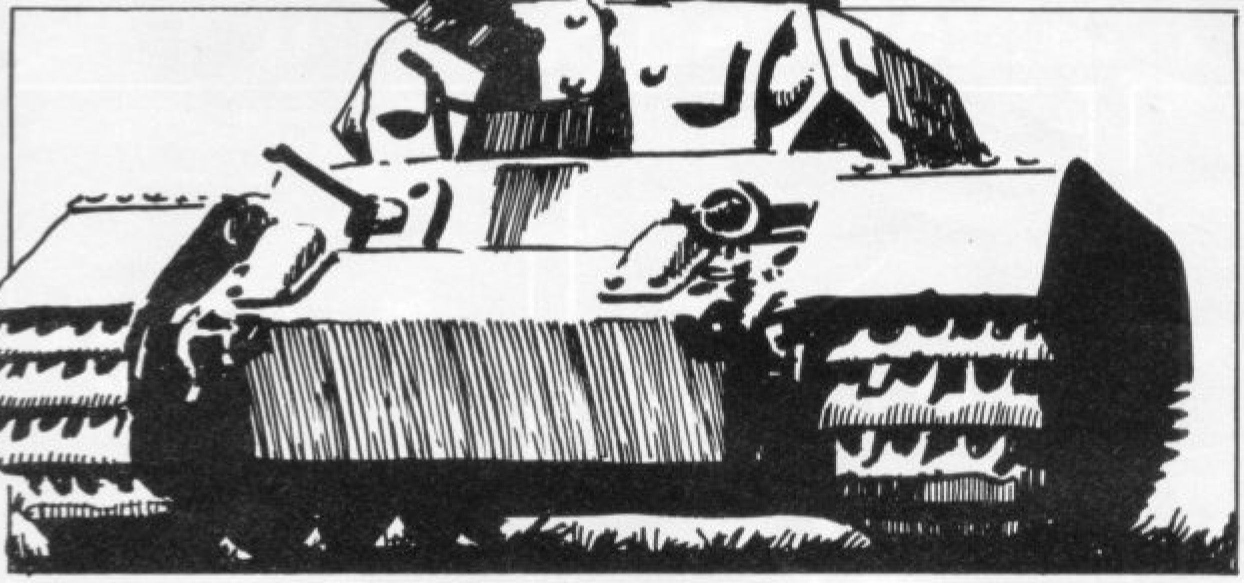
Zombies in space

WE EXPECT you often wonder where space invaders go when they have been wiped from the screen by your laser cannon or smart bomb. You may be surprised to learn that they are brought back to the living-dead and signed-on by MikroGen to take part in a new game for the 16K or 48K Spectrum, called **Space Zombies.**

It is for one or two players and can be played at slow, normal or fast speeds. The aliens look like space invaders but behave like Galaxians, swooping down and releasing their bombs. The aliens also loop the loop and vanish from the sides of the screen on several occasions.

The problem with the invaders is that they behave like real zombies — of the dumb kind — and would win no prizes on Mastermind. In some cases they line up waiting to be killed.

A player continues until a ship is destroyed by the zombies — then it is the turn of the second player. Space Zombies is an interesting and original game. It costs £5.95 and is available from MikroGen, 24 Agar Crescent, Bracknell, Berkshire.



Tank aims for 3D

THE GUN TURRET of your tank is pointed at the deserted bridge. An enemy tank moves silently into your sights and its turret moves threateningly around to point at you. You press the fire button and a salvo of shells lands on the enemy tank, blowing it to pieces.

That is how a new 3D game for the 48K Spectrum, called **3D Tanx,** starts. You can move left and right and move the gun turret up and down. The 3D effect is best seen when you move the turret up and down. The computer allows one or two users to play and it allows you to choose how easy or difficult the game should be. The menu of options also makes it possible to re-define which keys you want to use to move your tank around. The original combination of keys is very difficult to use and it is a good idea to use that option.

The manufacturer of 3D Tanx, DK'tronics also has an exciting version of the arcade game **Centipede.** It is like the original game in almost every way, with bouncing blue spiders, mushrooms and, of course, the deadly alien Centipede. In this version you have three laser bases with which to destroy the Centipede.

Both games are extremely addictive and show that DK'tronics can still produce good-quality software. Both cassettes can be obtained from DK'tronics, 23 Sussex Road, Gorleston, Great Yarmouth, Norfolk. Each game costs £4.95.

Precision logic strategy

COMPUTER LOGIC, strategy and encounters in space are some of the thrills awaiting owners of the 16K Spectrum with three games from Precision Software Engineering. The games are on one tape and are put together under the obvious title of **Games Tape Three.**



The first is **3D Noughts and Crosses.** There are four boards on which to put your nought and each is made up of four by four squares. That means you have three dimensions in which to lose to the computer.

Losing is very easy, as the computer is fast and seems to know what you will do, as well as keeping track of its moves.

The next game is **Tower of Brahma.** It is colourful, uses high-resolution graphics, is difficult to beat, and is very standard for a computer game.

Wipe Out is a board game for two players. The players have to out-manoeuvre each other and wipe a series of noughts and crosses from the board to gain points.

We regard the last game on the tape, **Astro Wars,** as the most important piece of software in this release. The game is played in three sections and takes its action from the films *Star Wars* and *The Empire Strikes Back.* The sequences are fighting the imperial fighters; destroying the Death Star; and battling the Imperial Walkers. All of those sections are in 3D and movement is smooth and fast.

All four games cost £6.95 and the tape is available from Precision Software Engineering, 20 Shelton Avenue, Newark, Notts. NG24 4NX.

Finely-tuned assembler by Aspect

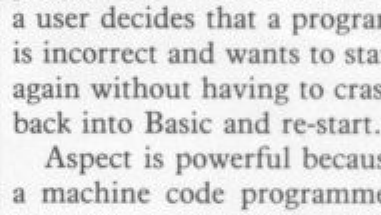
THE RELEASE of the **Aspect** assembler for the 16K and 48K Spectrum has been delayed several times during the last few months. The result is a finely-tuned and powerful assembler/editor package.

As well as the assembly facility, Aspect has a great deal of flexibility in editing finished programs. It is possible to run backwards and forwards through a program line by line. The editor will also search, or hunt, for specified text strings which are to be used on the screen so that the user can check them before running the program.

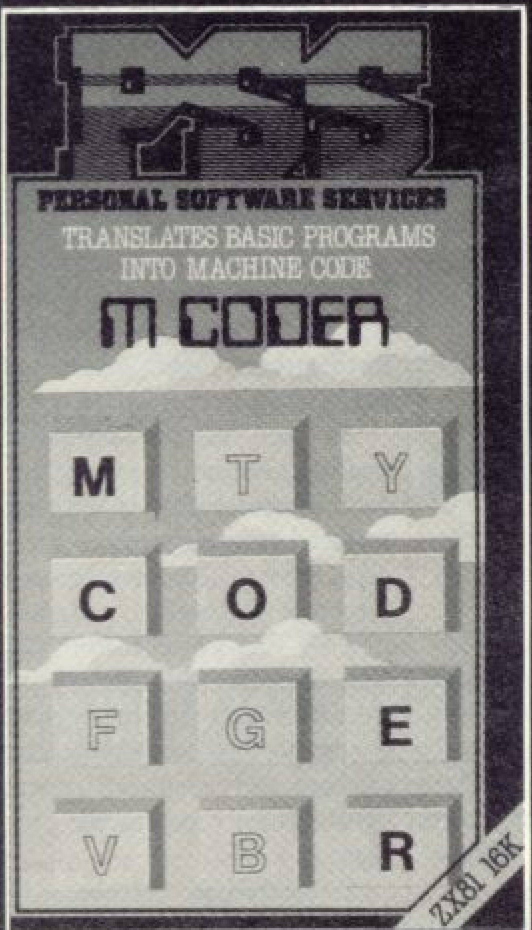
A specified number of lines can be deleted by the editor if a user decides that some code is redundant. The program can also be deleted if a user decides that a program is incorrect and wants to start again without having to crash back into Basic and re-start.

Aspect is powerful because a machine code programmer can treat an assembler code program almost as if it were Basic. That is possible because of the use of line numbers to identify separate lines of code, rather like those which are used in Basic listings.

Aspect is an ideal tool for machine code programmers although, because other assemblers have been available for some time, Bug Byte may have lost the lead in this market. The assembler/editor costs £9 and is available from retail outlets such as W H Smith.



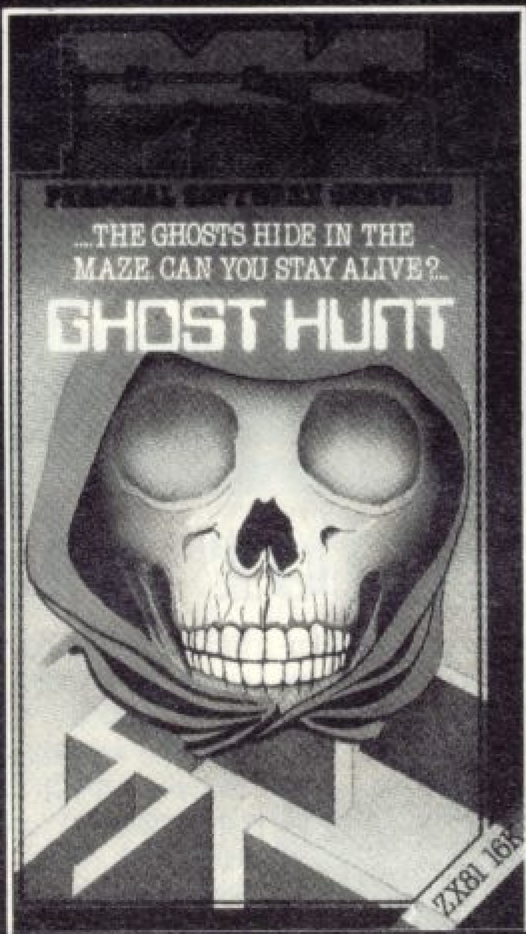
Arcade Style Games
for the ZX81 16K and Spectrum



M Coder

Quite simply the most flexible integer compiler available today for either the 16K ZX81 or the Spectrum 16K/ 48K.
M Coder will translate 95% of all non- string basic. The ZX81 version is just over 2K, The Spectrum version just over 3K.
Simply load M Coder, load your basic program or type one, use a print USR command and watch your program being compiled into super fast machine code.

SPECTRUM 16K-48K £8·95
ZX81 16K £7·95



Ghost Hunt

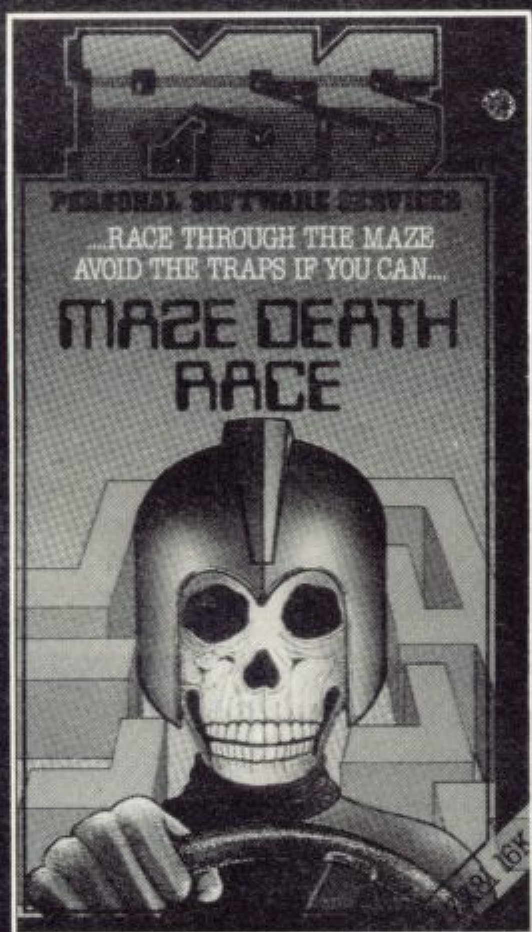
Gobble your way through a maze - Ghosts, power pills etc. All machine code. Super fast action.

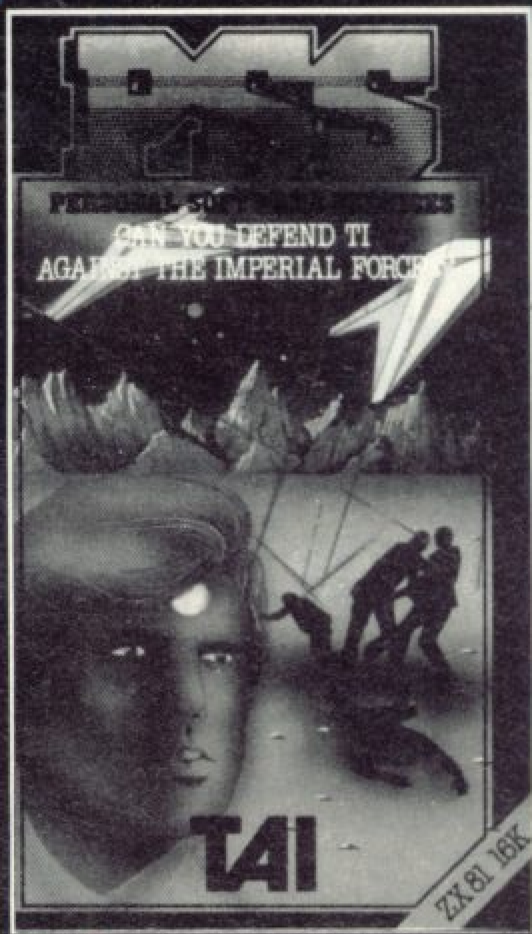
SPECTRUM 16-48K £4·95
ZX81 16K £3·95

Maze Death Race

Drive through a giant maze, 9 times the size of the screen, picking up points as you go - but watch out for the other cars, rocks oil and ice. Superb machine code game.
Highly recomended.

SPECTRUM 48K £4·95
ZX81 16K £3·95





Tai

In any other time or galaxy, the dust ball of a world called Tai would have been quite unimportant.
TIMES CHANGE.... Now it is the last remaining out post between the advancing Imperial Fleet and the main planets of the Dorfian system. Unless the Imperial Forces can be held off until the Republican battle fleet arrives, an entire civilization will be betrayed....
You have been chosen to defend Tai, the Galactic future depends on you....

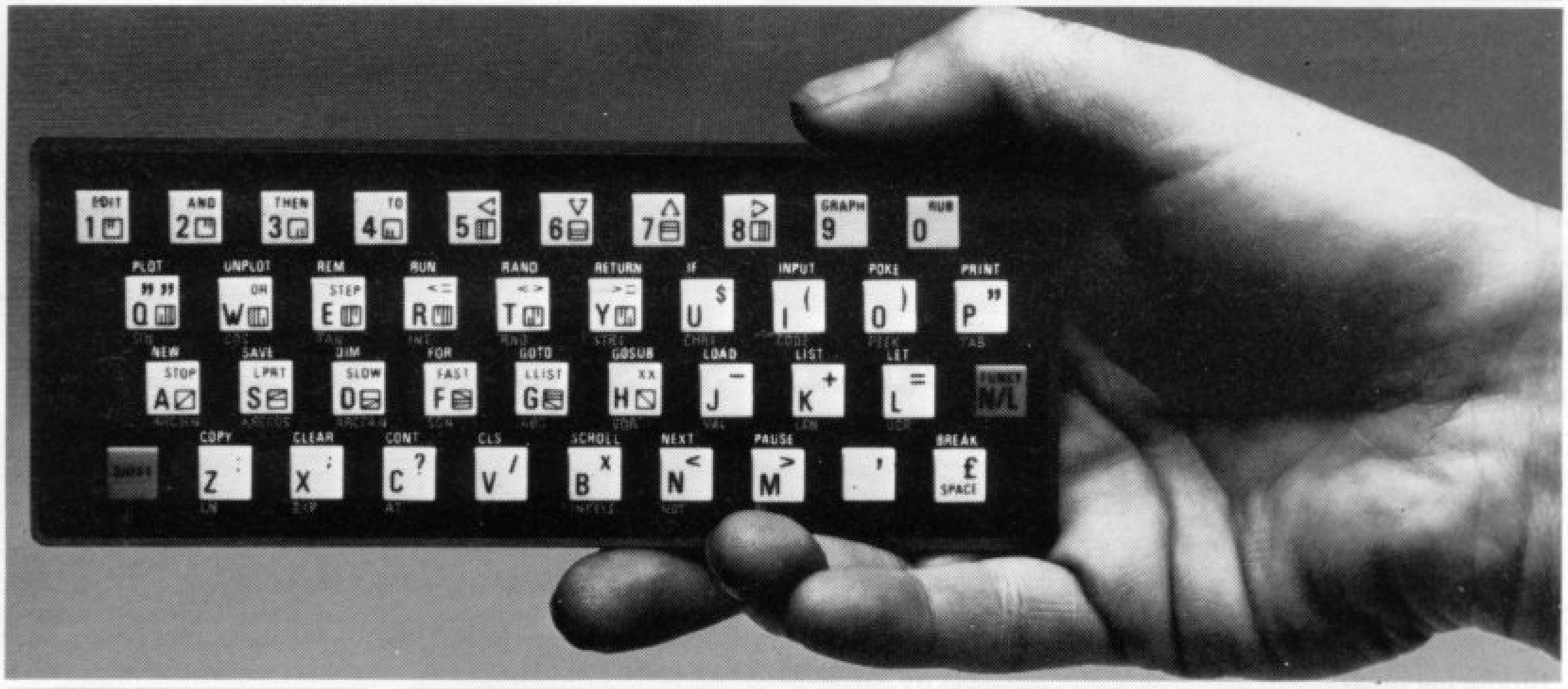
ZX81 16K £4·95

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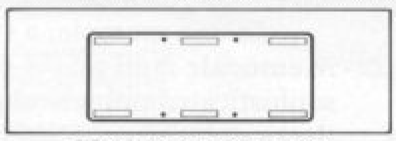
Available from all good Computer Stores or by Mail Order

NOW. A ZX81 PUSH-BUTTON KEYBOARD FOR UNDER £10.

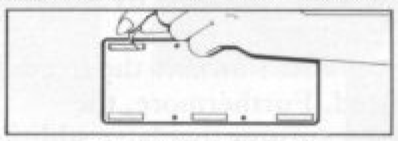




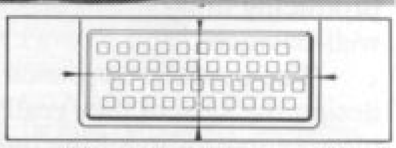
1. Make sure the original keyboard is clean and check that all the keys function.



2. The Buttonset is held in place by self-adhesive pads.



3. So all you do is remove the protective backing.



4. And place it centrally on your ZX81.

At last there's a really cheap but efficient way of ironing out the ZX81's only real bug: its keyboard. The Filesixty Buttonset offers:

■ A full-travel calculator-type moving keyboard for only £9.95. ■ Installed in seconds. The peel-off adhesive backing means you just register into position and press. ■ No messy labels, dismantling or soldering. ■ 3 groups of colour keys to pick out shift, numerals and newline. ■ Precision moulded in ABS to match your ZX81, with contrasting legends for maximum legibility.

Filesixty Ltd., 25 Chippenham Mews, London W9 2AN, England.
Tel: 01-289 3059. Telex: 268 048 EXTLDN G 4087.

Orders to Filesixty Ltd., FREEPOST, London W9 2BR.

Cheques/PO made payable to Filesixty Ltd.

Please send me ______ (qty) Buttonset(s) at £9.95 each (including VAT and P&P).

Total £ ______ BLOCK CAPITALS

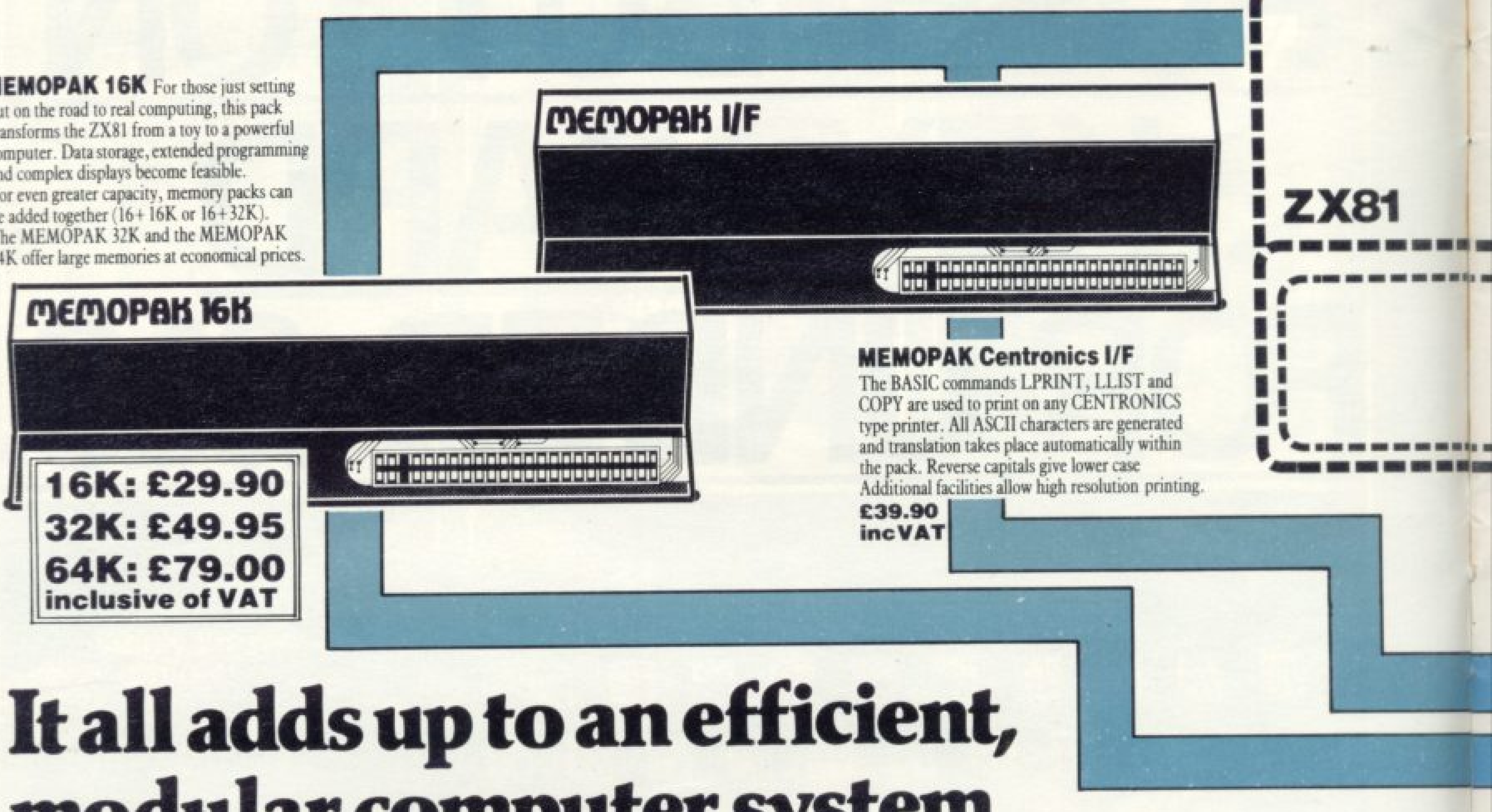
Name ______

Address ______

SU6

FILESIXTY

At Mem
we realise the poten



MEMOPAK 16K For those just setting out on the road to real computing, this pack transforms the ZX81 from a toy to a powerful computer. Data storage, extended programming and complex displays become feasible.
For even greater capacity, memory packs can be added together (16+16K or 16+32K).
The MEMOPAK 32K and the MEMOPAK 64K offer large memories at economical prices.

16K: £29.90
32K: £49.95
64K: £79.00
inclusive of VAT

MEMOPAK Centronics I/F
The BASIC commands LPRINT, LLIST and COPY are used to print on any CENTRONICS type printer. All ASCII characters are generated and translation takes place automatically within the pack. Reverse capitals give lower case. Additional facilities allow high resolution printing.
£39.90 inc VAT

It all adds up to an efficient, modular computer system

The **Memotech** approach to microcomputing is to take the well-proven and popular ZX81 as the heart of a modular system. This small computer houses the powerful Z80A processing unit and acts as the central processor module through which the **Memopaks** operate.

Memotech has a reputation for professional quality, producing units which are designed to fit perfectly, to look well-balanced, and to work efficiently and reliably.

The modular approach gives ZX81 owners the freedom to design the system they really need. Furthermore, the intercompatibility of the modules ensures that later additions will click straight in, to give you a system that grows with your ambitions and abilities.

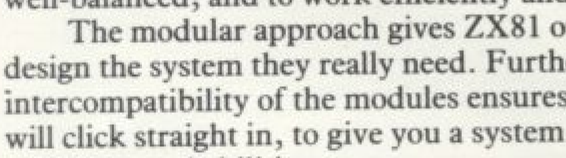
To ensure that your expectations are realised, care is taken at every stage to design features into the system to anticipate your needs. For example:
1) Memories are cumulative e.g. 16K and 32K can be added to the **Memopak 16K** or even to the Sinclair 16K RAM pack. **2**) The **HRG** firmware allows commonly used constructions (such as scrolling, shading and labelling graphs), to be called by a few simple commands. **3**) The **Centronics I/F** converts ZX81 character codes into ASCII and extends the print line to the width of the printer, still using the LLIST, LPRINT and COPY commands.

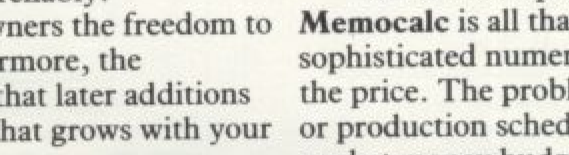
As one example, a system with 16K of memory and **Memocalc** is all that is required to perform the same sophisticated numerical projections as a computer at 10 times the price. The problem may be as complicated as a cash flow or production schedule, or as simple as household accounts or pocket money budgeting. If your bank manager wants to see a cash flow, then a single print instruction to the **Centronics I/F** will give a printout which is more than acceptable.

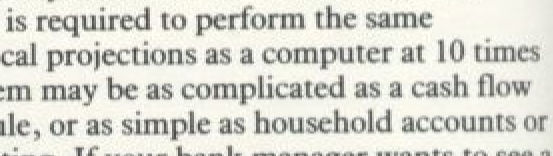
The example system which is shown, on the other hand, would satisfy the needs of someone who wanted to enter data

How it all fits together

You can see from the diagrams how various Memotech/Sinclair units can be combined.







otech, tial of your ZX81...

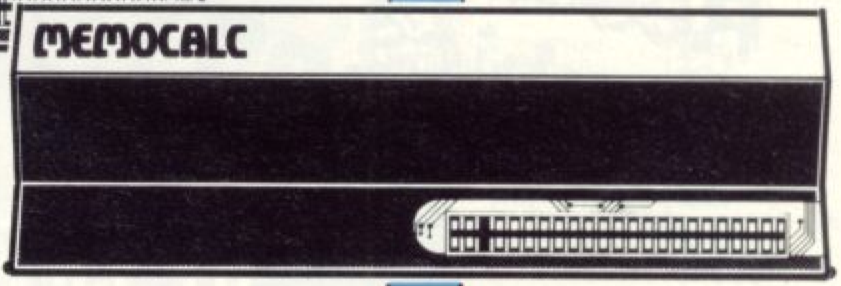


MEMOPAK HRG This pack breaks down the constraints imposed by operating at the ZX81 character level and allows high definition displays to be generated. All 248 × 192 individual pixels can be controlled using simple commands, and the built in software enables the user to work interactively at the dot, line, character, block and page levels. Scrolling, flashing and animation are all here.

£39.90 inc VAT

MEMOCALC The screen display behaves as a 'window' on a large sheet of paper on which a table of numbers is laid out. The maximum size of the table is determined by the memory capacity, and with a MEMOPAK 64K a table of up to 7000 numbers with up to 250 rows or 99 columns can be specified. Each location in the table can be either a number which is keyed in or a formula which generates a number.

£29.90 inc VAT

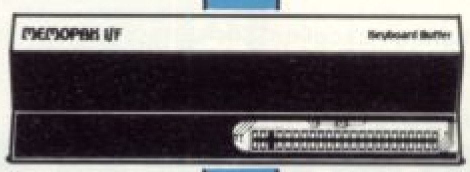




MEMOTECH KEYBOARD
The Memotech plug-in Keyboard plus buffer pack takes the effort out of data entry for ZX81 users. The Keyboard has a light professional touch and is housed in an elegant aluminium case. The simple plug-in system means that you are not obliged to open up your ZX81, use a soldering iron or invalidate your ZX81 warranty.

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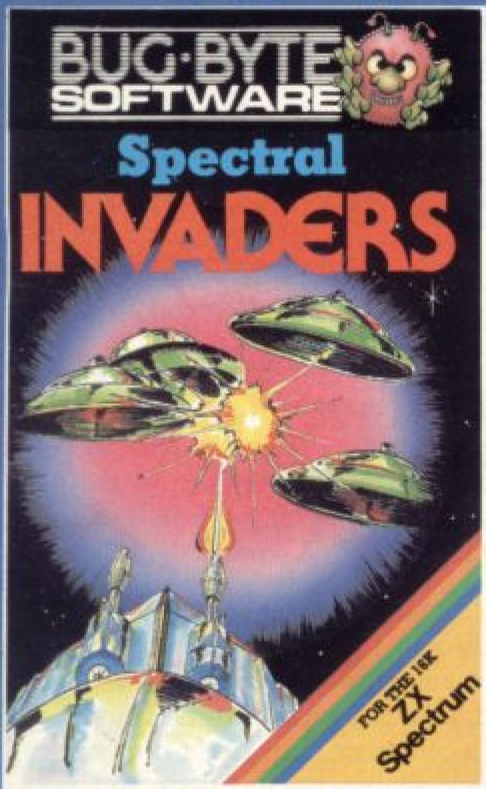
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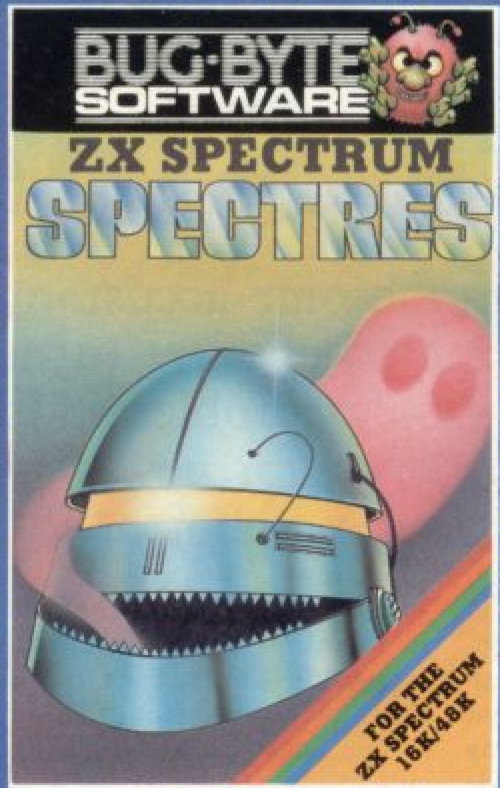


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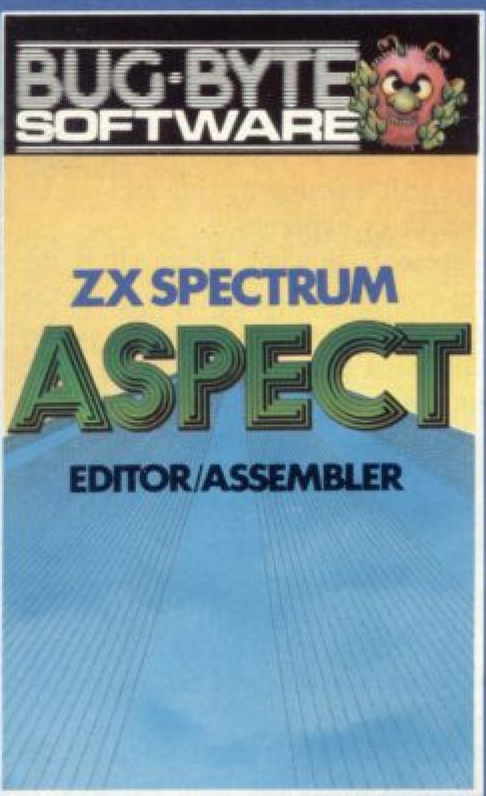


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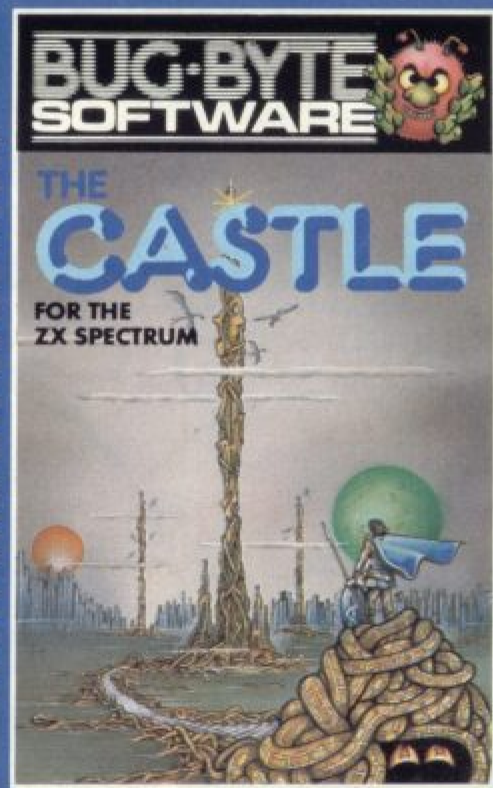


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Tower of Babel hits Sinclair

As more users become accustomed to Sinclair Basic and its limitations they have turned to other languages to help solve particular problems. John Gilbert investigates the growing demand for new ways of conversing with your machine, such as Forth, Pascal, Logo and Lisp.

BASIC, as used on the ZX-81 and Spectrum, is a high-level language. That means that it is easily understood by human operators but that the computer has to translate any entry made by a user into the code which it understands.

Basic was designed to help people become accustomed to a computer and was not written to perform any particular task. That is the problem with it when compared to other languages. Languages such as Forth and Fortran were written to perform specific tasks.

Forth has already been implemented on the ZX-81 and some versions are available for the 48K Spectrum. The language was designed originally for engineers who needed to process formulae. It runs at many times the speed of Basic and, with graphics added to the list of commands available, you can play a good game of space invaders by using it.

The most interesting aspect of Forth is that you can define your own commands using words which already exist as part of the standard system. A dictionary of those words usually is accessible on the system using a list command. For instance, if you want to find the square of a number you would use the standard word DUP. If you want to find the square of a number squared again you could define your own word, for instance DUPD, by defining it as DUP*DUP. All that seems very complicated if you are used to Basic.

Some languages require even more discipline on the part of the programmer.

Pascal, for instance, is a language which requires the programmer to define all variables and functions used throughout the program in the first section of the code. A program written in Pascal must then be structured as a series of routines, each routine being relatively independent of the others.

The language is slightly more difficult to use than Basic as it forces the programmer to think about how the code is to be put into the computer, which operations are to be performed first, and where routines are to be placed in a program, instead of deciding what code you need for a specific job.



"Hmm . . . it's not so much BASIC as EARTHY."

Children and schoolteachers are becoming interested in a language called Logo, which has been imported from the U.S. Its inventor is Seymour Papert and embodied in it are several controversial concepts which many educationalists are beginning to question.

The emphasis of the language lays with teaching children about mathematics through graphics shapes on the screen and through the use of a robot, called a turtle, which can be controlled from a computer. The robot can be used to draw shapes on the floor and puts into practice the concept of learning by experience.

Educationalists in Britain are sceptical about using turtles in that way. The reason is that learning in British schools has been, and still is, by the repetitive rote learning method.

Some schools are experimenting with turtles but the lessons taught using them have been structured so that children are still learning by rote and not by experiment or experience.

At present, Sinclair Research is designing a version of Logo to work on the Spectrum. Edinburgh University is also working hard to produce a floor turtle for the machine. The language will be supplied free to schools which choose the Spectrum under the Government Microcomputers in Schools scheme.

The artificial intelligence language Lisp has already been released for the Spectrum by Serious Software. Lisp is used for list processing and programs can be written which will act like intelligent databases.

Serious Software has provided a database written using the Lisp package. It includes the names of a family group with relations which they form to each other. Using the program you can discover which members of the family have children, which have brothers, and whether those brothers are married. The database seems intelligent because you can ask it questions which are limited only by your imagination.

Normal databases would allow information to be accessed only using such techniques as entering a keyword to

find data. You can also use Lisp to write programs which will seem to give meaningful answers to entries you type into the computer. The computer will select an answer depending on the data which is stored in its memory and how it has answered questions similar to the current one.

Programs which simulate this type of intelligent computer response have been written in Basic. One such program, Eliza, acts like a human psychiatrist and many of the replies it generates seem almost too much like human response.

The Eliza program in Basic is amusing but with large amounts of data in memory the program will respond very slowly, sometimes taking two minutes to analyse entries. Lisp was devised for that kind of work and so it has the advantage of speed over Basic in this area.

Most computer languages were designed with a purpose. Unfortunately, languages like Basic have been corrupted and are now used for different purposes from those which their designers had intended.

Basic was not intended as a commercially-used programming language for the design of space invader games. Unfortunately, programmers can use only the langauge available to them and on the Spectrum that is either Basic or machine code.

Sinclair is now making it possible to use other languages but Basic is still the most popular, not because people like it better than other languages but because very few people have had the opportunity to use any of the others.

Only one small microcomputer has been produced which will run a language other than Basic, the Jupiter Ace. Sinclair is definitely an innovator in the market, so perhaps a micro with a new dedicated business language may be the next step — and perhaps the idea behind a ZX-83.

FORTH
Artic Computing, 396 James Reckitt Avenue, Hull, North Humberside. (48K Spectrum/ZX-81).
Abersoft, 7 Maes Afallen, Bow Street, Dyfed SY24 5BA. (Spectrum 48K).
PASCAL
Interface, Dept. SU, 44–46 Earls Court Road, London W8 6EJ. (Book with Basic compiler).
LOGO
Sinclair Research, Freepost, Camberley, Surrey GU15 3BR. (Spectrum — to be released).
LISP
Serious Software, 7 Woodside Road, Bickley, Kent BR1 2ES. (Spectrum 48K).

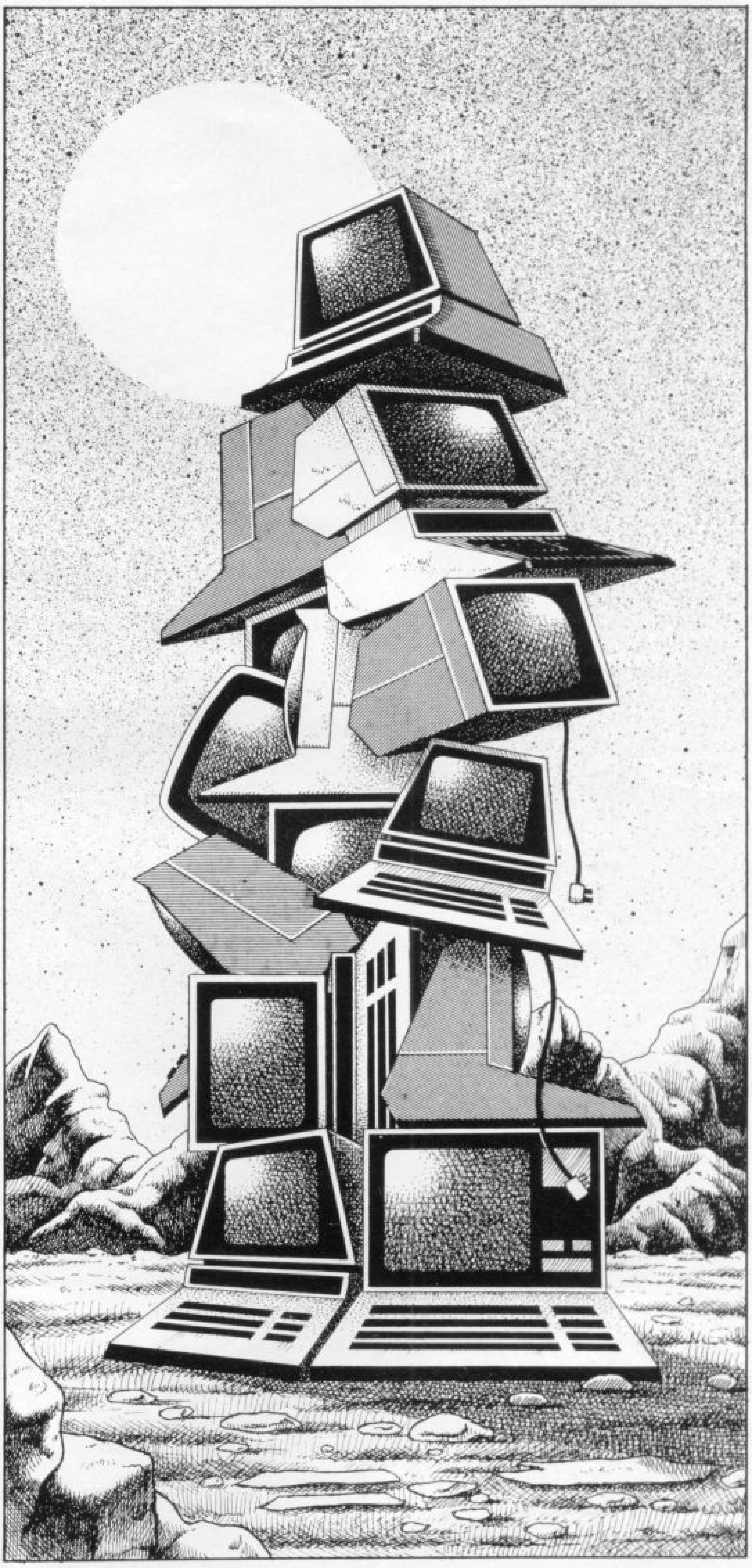


Illustration by Stuart Briers



3D SPAWN OF EVIL £4.95 Deep into the galactic void, hosts of alien spawn go through a complex multi-stage breeding cycle. Your task is to seek out and smash the cycle to eliminate the spawn before it matures to full attack potential. This is the most spectacular 3D space game ever written for this 16K Spectrum.

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SOUND FX £4.95 Released by popular demand, this is the program that was used to create most of the sound effects featured in our game. It enables you to create an infinitely variable amount of machine code sounds, and use them in your own basic programs. Even the beginner can use this program to create fantastic sounds for his own programs.

DISASSEMBLER £4.95 This is a fast machine code disassembler for use on the 48K and 16K Spectrum. It gives full colour output to the screen, grouping together similar instructions in the same colour, IE: all loading instructions are green. You have options for output into the screen or printer, this output be in decimal or hex.

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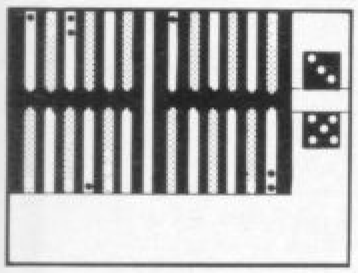
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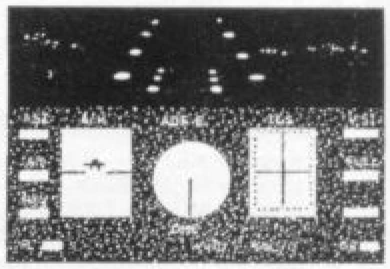
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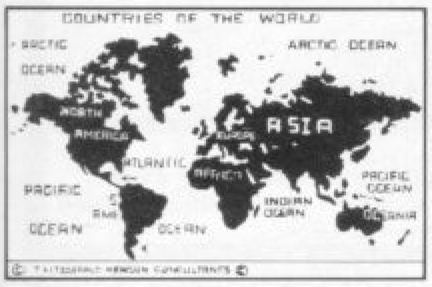
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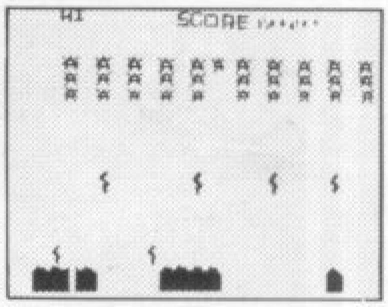
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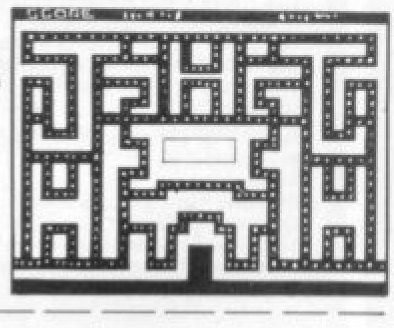
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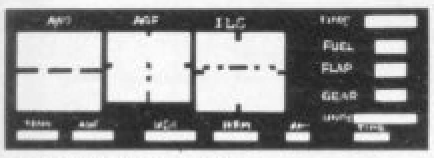
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Innovation is the route to success

Clive Sinclair gave his views to the London Business School on how to start a business even when the times do not appear perfect

THE CLIVE SINCLAIR secret of business success is innovation. He said so during a recent talk at the London Business School.

The large multi-nationals, he said, are already involved in almost every field and it is necessary for a new venture to innovate. That may be through inventing a new product; finding a new method of marketing — as an example, 20 years ago Sinclair Radionics began selling electronic equipment by mail order, until which time it had been done by shops; the innovation may be in management techniques applied by the company, or it may be in the application of new levels of efficiency — either in cost of production or in profit on sales. To succeed, the new entrepreneur must think of what the future looks like and decide which direction to go.

Sinclair thought that the rate at which the world is changing has been relatively smooth for many years but that rate of change is becoming increasingly rapid. In particular, patterns of employment are changing. Traditionally the pattern of employment of large companies has been a gradual increase in the number of employees.

That approach is no longer viable. The time that it takes to co-ordinate huge numbers of employees ensures that large companies are always technologically behind smaller, more flexible companies and therefore less efficient. Large companies are now shedding employees. The rate at which they are shedding is increasing and it is an irreversible trend. The pattern will not change with the ending of the world recession.

Employment is based increasingly on a small team of specialists getting together, to work for a limited time on a specific project. A television producer, for instance, will sub-contract to various specialists — camera operators, script writers and the like. Those specialists work on a self-employed basis. It gives the employer more flexibility in the design and marketing of new products. That method of production provides an advantage to small new companies.

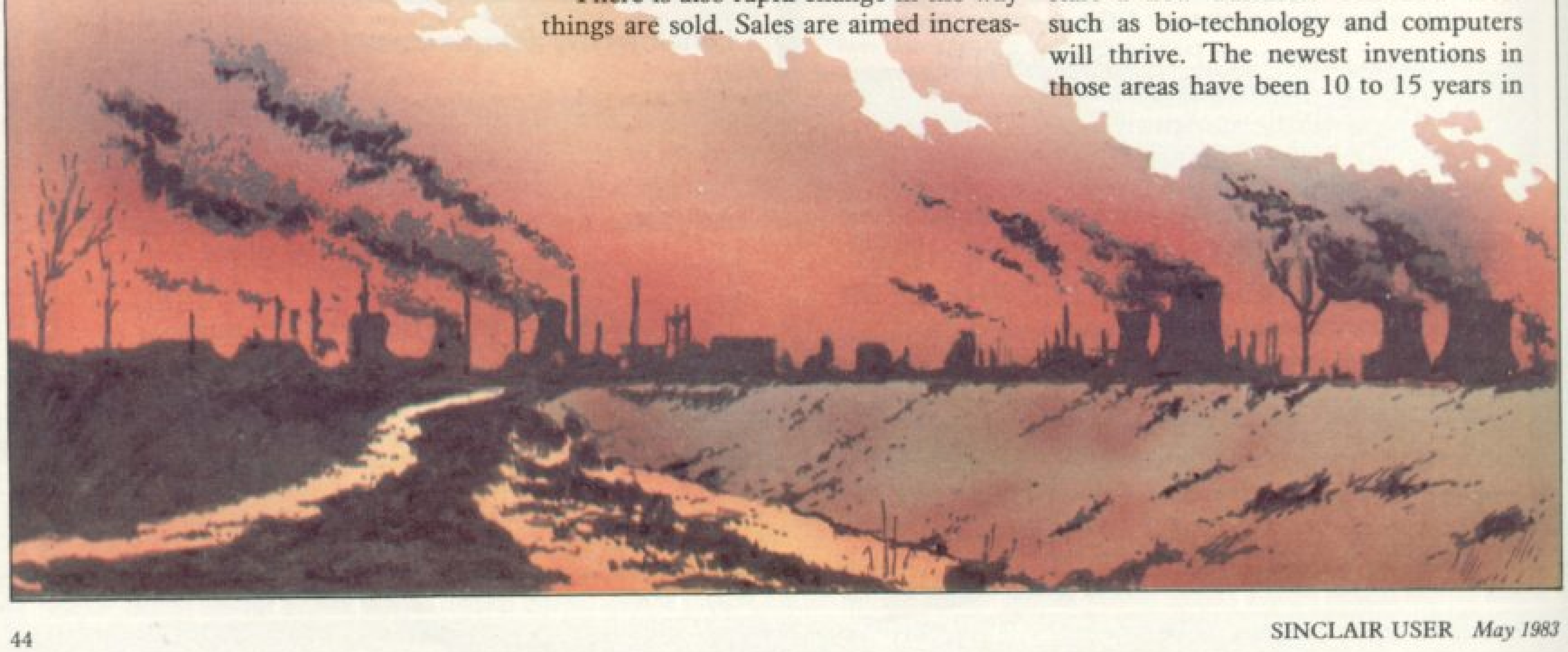
> 'New entrepreneurs must think of what the future looks like and decide what direction to go'

There is also rapid change in the way things are sold. Sales are aimed increasingly at world rather than home markets. Vast production runs for worldwide markets enable a company selling internationally to sell much more cheaply than could a local producer. That trend to world markets is irreversible unless the major economic powers set up trade and tariff barriers.

Sinclair added that the time is right to start a new business. Many economic observers think that the world has bottomed-out of its slump and that we are returning slowly to boom times. Even if one takes the opposite view there are good reasons for those with new ideas to start businesses now.

The Russian economist N D Kondratieff suggested that trade and production follows 50-year cycles. The first 20 years are a period of new inventions. During that time society struggles to produce the new inventions in sufficient quantities to meet the demand for them. That is a boom period. After that there is much lower demand, covering replacement as the goods wear out. Firms producing the new products go into fierce competition. There is a slump period, which lasts until another period of invention begins.

In the last 20 years there has been a surge of invention and technological change so this could be a good time to start a new business. The new areas such as bio-technology and computers will thrive. The newest inventions in those areas have been 10 to 15 years in



development before they reach mass markets. There are opportunities in those areas for new ventures.

A depression is a good time to start, even in those areas which have already been developed. Suppliers to those industries have become highly competitive. They use massive economies of scale and small profit margins. They are always looking for new customers.

An entrepreneur who can provide new custom will be supported by those suppliers — e.g., Sinclair has increased the output of Timex and has taken full advantage of Timex economies of scale in electronic manufacturing. During a depression, the new venture enjoys similar benefits from retailers. The retailers' sales of traditional products are declining and he is looking for new products to attract more customers.

In the next few years certain industries are set to boom. Among them are health, education, leisure, bio-technology and electronics. Transport, too, is due for a boom. That may seem surprising but the basic form of the motor car has not changed since the beginning of the century. There have been tremendous refinements but the form of internal combustion engine mounted on a steerable carriage has not changed. Whoever detects the next form will be a winner.

Two industries particularly stand out as potential growth areas — power generation and leisure travel. There is an enormous range of new ways of generating power which have been developed recently. For the most part we still rely on methods of generating power invented in the 19th century. The introduction of computers and automated manufacture will result in increased leisure travel, in the same way that the first industrial revolution led to greater leisure travel.

Sinclair also had advice on where the budding entrepreneur should seek backing. There are several Government schemes to finance new products but the greatest Government boons to new enterprises are the various tax exemption schemes.

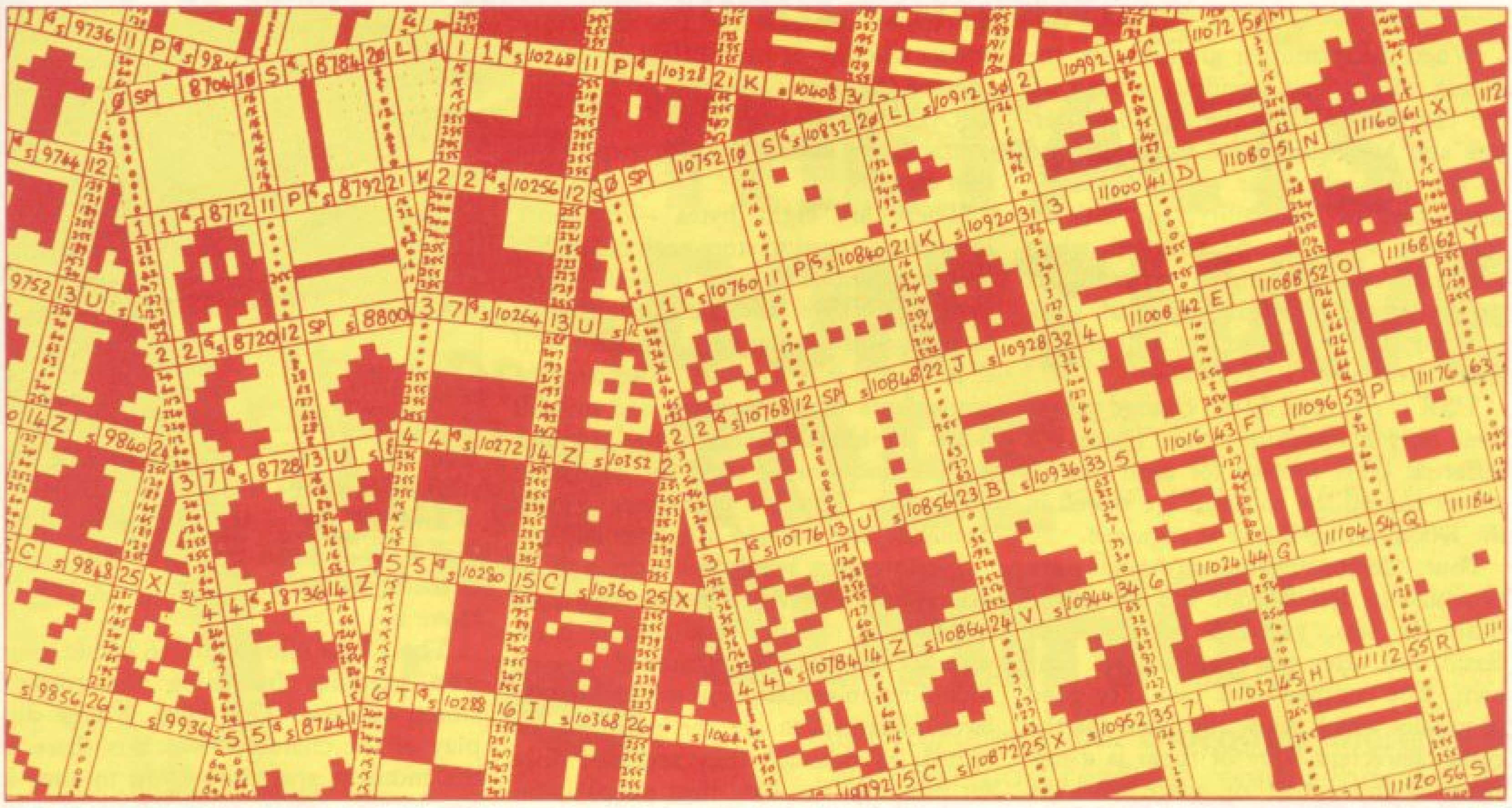
> 'A depression is a good time to start even in those areas which have already been developed'

Start-up capital can be exempt from taxation for up to three years. A company with a new product may start a separate company to launch the new product. The new company will be exempt from tax on capital for another three years. A very attractive aspect of that scheme is that it can be retroactive, allowing the new venture to save the money it pays in taxes, which may then be invested for further development.

Venture capital is a relatively new form of funding new businesses. It is an idea which has been operating in the U.S. for some time and is starting to become increasingly important in the U.K. Venture capital companies differ from the more traditional lenders, such as the banks, in that they offer help to the new venture in many ways. They will often provide experienced accountants and advice on management. That can be particularly helpful to an entrepreneur with no commercial background.

Despite the current volume of its daily trading, the Stock Exchange is no longer a practical way to raise money for a new project. A listing on the Stock Exchange requires time and a great deal of money. It tends to deal in the shares of large, well-established companies. The Unlisted Securities Market is faster and cheaper than the Stock Exchange. The Unlisted Securities Market is more risky for investors but the potential for profit is greater.





Stephen Adams assesses the graphics ROM from dK'tronics and finds it to be good value and easy to install and flexible in its use.

Simple character change is available for the ZX-81

DK'TRONICS 4K graphics ROM consists of a small printed circuit board and a set of instructions on how to fit it to a ZX-81. It fits inside the ZX-81 case underneath the keyboard beside the heat sink and requires the soldering of only three joints to the ZX-81 printed circuit board if the ROM is in a socket.

It offers seven character sets as alternatives to the Sinclair one stored in the Basic ROM. The extra character sets each contain 64 characters which can be space invaders, faces, upper- and lower-case letters, tanks, aircraft and many more.

The instructions are very easy to understand but the construction must be done in the order suggested, or things can be complicated. The kit will also cope with a ZX-81 with 8K ROM soldered into the printed circuit board. That requires that you make a break in one of the copper tracks on the PCB next to the ROM and insert a plug over the ROM. That plug can be inserted over the ROM but I would suggest that you solder it to the ROM, or it may cause a bad contact at a later date.

There is a plug on the other end of the ribbon cable which is connected to the plug on the ROM, so that if the graphics board should malfunction at any time the whole board can be removed, leaving the ZX-81 still working.

If your ROM is in a socket it is removed and replaced with the plug. The ROM then rests in another socket on the graphics board. The ribbon cable connecting the two plugs must be bent hard in the order shown in the instructions for it to fit inside the case but, once fitted, I found the board locked satisfactorily into the space between the heat sink and a plastic post used to hold the case together.

> 'The new sets of graphics can be used only one at a time'

The instructions for soldering the coloured wires are helped by the expanded sections of the ZX-81 printed circuit board shown in the diagrams. That makes it simple to make the connections and any spare wires can be inserted in the holes next to the +5V regulator — they are for expansion using the RAM socket or because the ROM was in a socket.

The only difficulty seemed to be that the various sockets on the board were supposed to be marked with coloured paint and there was none — not that it mattered, because the diagrams accompanying the kit are very good.

The last instruction reads: "Should you feel after reading these instructions that you are not able to fit the graphics ROM board, send it to us with £3 to cover post and packing". The company will then attach it to your ZX-81.

The new sets of graphics can be used only one at a time and the graphics from different sets cannot be mixed unless you have a user-definable graphics RAM chip inserted into the socket next to the ROM. Only one line of Basic needs to be used to call-up a new set of 64 graphics characters and so the graphics can be changed from within a program.

continued on page 48

continued from page 47

When using another graphics set, the listing will appear peculiar because all the characters, including numbers, letters and keywords, have been changed to the new character set. To restore some kind of readability, the Sinclair character set must be restored when LISTing or EDITing a program. A simple line in Basic such as 9999 LET L=USR 11939 will do that and all that is required is to GOTO 9999.

USR is required as the change can be done only in machine code. There is a different USR routine for each character set but all the routines are stored in the ROM, so no RAM is required.

Four demonstration programs are provided to demonstrate the use of the character sets, given a few lines of Basic, but after that you are on your own. The company has two very good programs which show the need for the extra characters. One of them is a machine code version of space invaders which produces proper missiles, invaders and explosions, as well as the laser bases.

They are all produced as individual characters, so that the whole thing is the same scale, with the flying saucers the same size as the aliens. That alone should save money.

The other program is also an arcade game, Centipede. Again written in machine code, it is virtually unbeatable. The Centipede breaks into several pieces if hit in the middle and the only way to defeat one is to hit it squarely on the head. Very good graphics, of course, are provided by the 4K ROM.

There are, however, several disappointments. One is the fact that the graphics can be printed-out only on the Sinclair printer by using a machine code routine stored above RAMTOP. That is because the printer routine changes the I register — which controls where the base of the character set is — back to the Sinclair character set. That means that only the ordinary characters will be printed.

The other is that the symbols on the sheets showing the graphics have no explanation as to how to use them. In the top left-hand corner is the character number and next to it on the same line is the character on the keyboard required to produce it. The next box shows whether or not SHIFT has to be pressed (S) or that you have to be in the GRAPHICS mode (GS). The next box contains the first address in memory of that character.

There are eight bytes — memory locations — used to store each character, one per line. The bits in those bytes give the dots for that line of the character; if the bit is binary 1 it is black and if it is binary 0 it is white. The decimal equivalents of those bytes are printed down the left-hand side of the graphics symbol and can be used for designing your own graphics characters if you decide to buy a RAM at a later date.

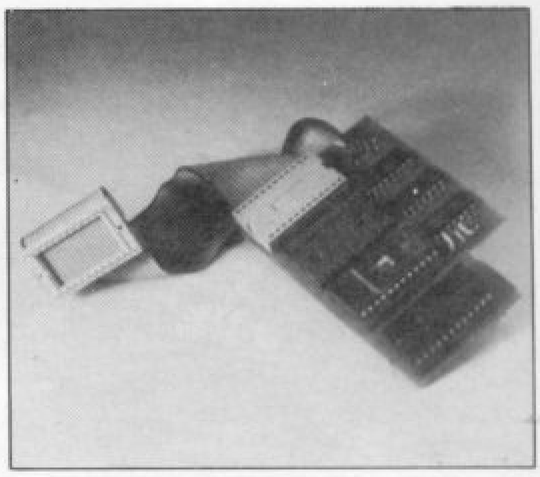
The graphics set also includes a set of upper- and lower-case letters but does not include numbers and instead it replaces them with punctuation marks, including an exclamation mark. I would have preferred to see the numbers retained, as although they are used only for bills and the like most people who would require a lower-case set would be businessmen to whom numbers are essential.

Most of the difficulties occur with a character set in ROM because it cannot be altered. The user-definable graphics set RAM chip — 1K or 2K versions are available — fits into the socket next to ROM on the 4K graphics board. That will allow you to store two or four character sets in RAM which can be selected from the graphics ROM or from Sinclair ROM — or they can be designed by you.

'Only one line of Basic needs to be used to call-up a new set of 64 characters and so the graphics can be changed from within a program'

The tape which accompanies the UDG gives 16K of explanation on how to transfer character sets into RAM, alter them character by character from ROM into RAM so that an 'A' may be replaced by a #, for instance. The tape is used to set up the character set you require for a particular program before running the program. There is even a facility by which the program can store the character set before the program required to run it on tape.

The program alters the character set in RAM and then LOADs the program which wants to use it. Once the character set is stored in RAM it is safe from any changes by the Basic — except POKE — as the Sinclair RAM for running the Basic program is separate.



The 4K ROM is stored at the 4K section above the 8K ROM — 8K–12K — and the 2K of RAM directly above that — 12K–14K — so if you have anything in that area it would be best to move it.

The UDG allows you to create your own graphics by using the routine stored on tape. That gives a large display of the character which is there at the moment and allows you to alter it line by line. That makes it very easy to see your graphic before you want to use it and to alter it if it is incorrect.

The tape, apart from the printer routine, is in Basic and is at times rather slow, especially when POKEing to change a set of characters, but it allows you to understand and alter the sections you dislike. That makes the graphics ROM come alive as the user can program the character set as he wishes — the ROM cannot be re-programmed.

The 4K graphics ROM is satisfactory for games and the like when all the characters you require are in one set. A number of building-block characters can be used to make your own characters from several small ones. On a 16in. TV the individual graphics characters are still only one-quarter of an inch high and the same in width, so that can be a great advantage.

The tape and the extra RAM to fit on the graphics board make the graphics ROM come alive. It is a pity that dK'tronics does not produce a similar tape for the ROM alone, as I am sure I am missing something by not knowing how to make maximum use of it.

The board is very good value and if more software can be written for it, should be even better.

The graphics ROM costs £29.95 and can be fitted by the company to your ZX-81 for an extra £3. The user-definable graphics RAM is £5.95 for 1K and £9.95 for 2K. Both RAMs are complete with the tape for controlling the character set. dK'tronics is at 23 Sussex Road, Gorleston, Great Yarmouth, Norfolk. Tel: 0493-602453.

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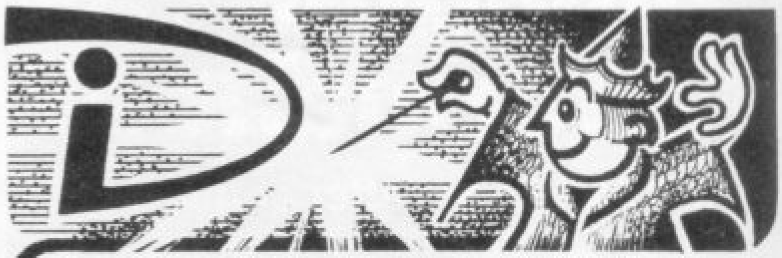
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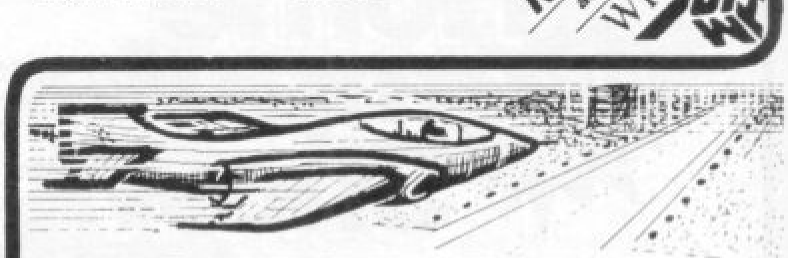


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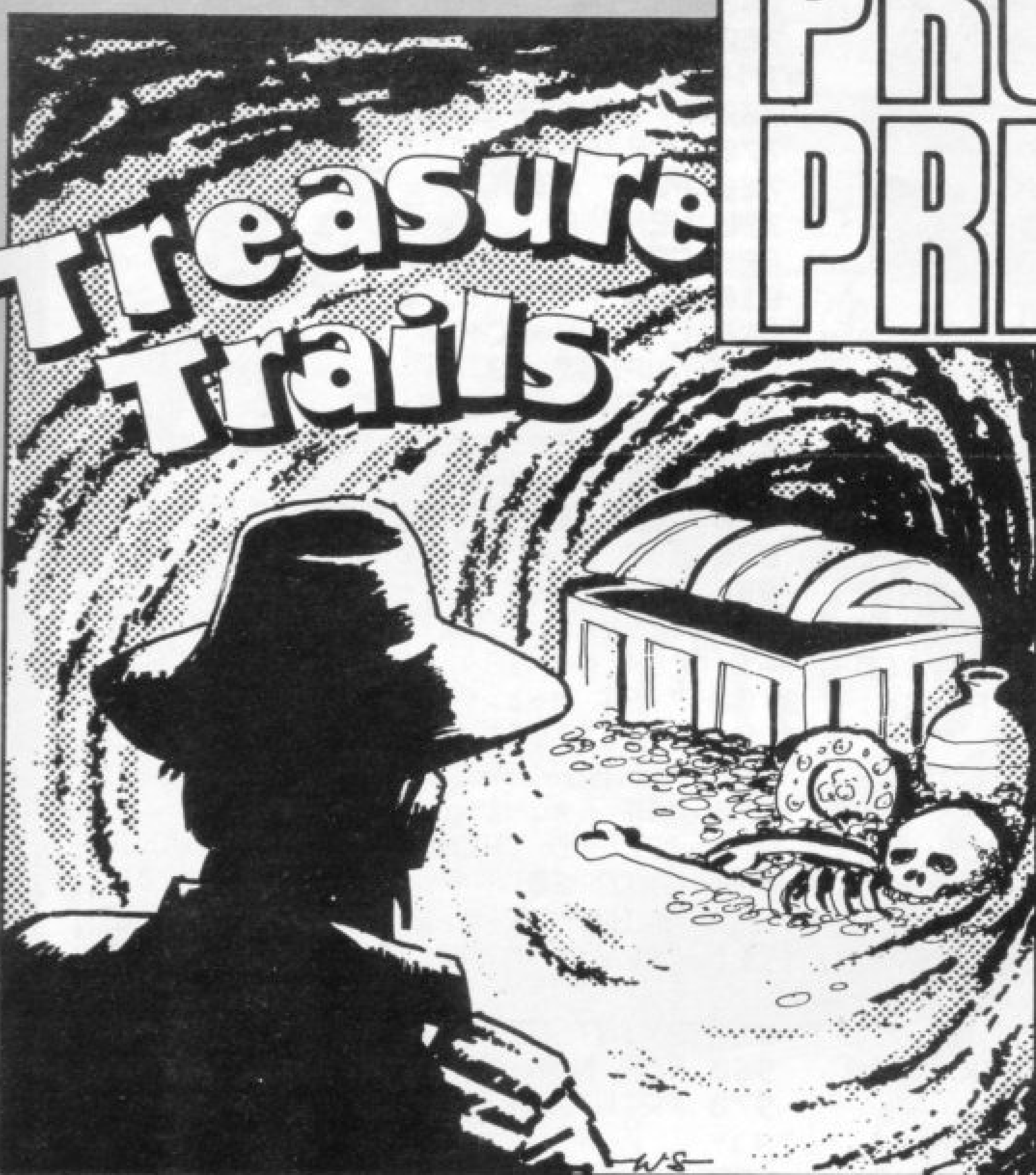
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PROGRAM PRINTOUT



THE OBJECT of **Treasure Trails,** written by Adrian Laird of Norfolk for the 16K ZX-81, is to move quickly around a maze, collecting the treasure at the end of each passageway. That is made more difficult by the doors which open and shut, blocking your way, and causing you to lose a life if you run into them.

You score 50 points for each treasure you collect within your time limit and score bonus points for collecting your last treasure. Move using the usual cursor keys—5, 6, 7 and 8.

Graphics instructions are given in abbreviated form, separated by colons, in brackets. IS=Inverse space, IX=Inverse "X", GA=Graphic "A", G7=Graphic "7", and the like.

```
  10 REM GOLD RUSH
  20 REM BY A.LAIRD
  30 LET L=3
  40 LET SH=1
  50 LET SC=0
  60 IF SH=1 THEN LET TM=43
  70 IF SH=2 THEN LET TM=42
  80 IF SH=3 THEN LET TM=41
  90 IF SH=4 THEN LET TM=40
 100 IF SH=5 THEN LET TM=39
 110 IF SH=6 THEN LET TM=38
 120 IF SH=7 THEN LET TM=37
 130 IF SH>=8 THEN LET TM=36
 140 LET TR=8
 150 LET X=10
 160 LET Y=11
 170 PRINT AT 0,0;"(IS)SCORE(6*
IS)SHEET(3*IS)"
 180 FOR F=1 TO 20
 190 PRINT AT F,0;"(IS:20*GA:IS)
"
 200 NEXT F
 210 PRINT "(22*IS)"
 220 IF L=3 THEN PRINT AT 21,0;"
(IS:2*IX)"
 230 IF L=2 THEN PRINT AT 21,0;"
(IS:IX:IS)"
 240 IF L=1 THEN PRINT AT 21,0;"
(2*IS)"
 250 LET C=1
 260 FOR F=1 TO 20
 270 PRINT AT F,C;" "
 280 LET C=C+1
 290 NEXT F
 300 LET C=1
 310 FOR F=20 TO 1 STEP -1
 320 PRINT AT F,C;"  "
 330 LET C=C+1
 340 NEXT F
 350 PRINT AT 10,0;"(IS:20*SPACE
:IS)"
 360 PRINT AT 11,0;"(IS:20*SPACE
:IS)"
 370 PRINT AT 1,21;"(IS)";AT 20,
21;"(IS)"
 380 FOR N=1 TO 20
 390 PRINT AT N,10;"   "
 400 NEXT N
 410 PRINT AT 7,10;"(3*G6)";AT 1
4,10;"(3*G7)"
 420 PRINT AT 10,8;"(G8)";AT 11,
8;"(G8)";AT 10,14;"(G5)";AT 11,1
```

```
4;"(G5)"
 430 PRINT AT 1,1;"*";AT 1,11;"*
";AT 1,20;"*";AT 11,1;"*";AT 11,
20;"*";AT 20,1;"*";AT 20,11;"*";
AT 20,20;"*"
 440 FOR F=0 TO TM
 450 PLOT 63,F
 460 NEXT F
 470 PRINT AT 18,30;"T";AT 19,30
;"I";AT 20,30;"M";AT 21,30;"E"
 480 PRINT AT 0,8;SC;AT 0,19;SH
 490 FOR K=0 TO 4
 500 PRINT AT X,Y;"X"
 510 PRINT AT X,Y;" "
 520 IF K=3 OR K=4 THEN PRINT AT
 7,11;" ";AT 14,11;" ";AT 10,8;"
 ";AT 10,14;" ";AT 5,5;"(IS)";AT
 5,17;"(IS)";AT 16,5;"(IS)";AT 1
6,17;"(IS)"
 530 IF K=0 OR K=1 OR K=2 THEN P
RINT AT 7,11;"(G6)";AT 14,11;"(G
7)";AT 10,8;"(G8)";AT 10,14;"(G5
)";AT 5,5;" ";AT 5,17;" ";AT 16,
5;" ";AT 16,17;" "
 540 IF SH=2 OR SH=3 THEN GOTO 1
020
 550 IF SH>=4 THEN GOTO 1050
 560 LET X=X+(INKEY$="6" AND X<2
0)-(INKEY$="7" AND X>1)
 570 LET Y=Y+(INKEY$="8" AND Y<2
0)-(INKEY$="5" AND Y>1)
 580 PRINT AT X,Y;
 590 LET Z$=CHR$ PEEK (PEEK 1639
8+256*PEEK 16399)
 600 IF Z$="*" THEN GOTO 670
 610 IF Z$<>" " THEN GOTO 880
 620 NEXT K
 630 UNPLOT 63,TM
 640 LET TM=TM-1
 650 IF TM=-1 THEN GOTO 880
 660 GOTO 490
 670 LET SC=SC+50
 680 PRINT AT 0,8;SC
 690 FOR F=0 TO 10
 700 PRINT AT X,Y;"X";AT X,Y;"(I
X)";AT X,Y;"*";AT X,Y;"X"
 710 NEXT F
 720 LET TR=TR-1
 730 LET TM1=TM
 740 IF TR=0 THEN GOTO 810
 750 IF SH=2 OR SH=3 THEN LET TM
=TM+1
 760 IF SH>=4 THEN LET TM=TM+2
 770 FOR F=TM1 TO TM
 780 PLOT 63,F
 790 NEXT F
 800 GOTO 490
 810 FOR F=TM TO 0 STEP -1
 820 LET SC=SC+50
 830 UNPLOT 63,F
 840 PRINT AT 0,8;SC
 850 NEXT F
 860 LET SH=SH+1
 870 GOTO 60
 880 FOR F=0 TO 10
 890 PRINT AT X,Y-1;"(G4 GT G3)"
;AT X+1,Y-1;"(G1 G2 G2)";AT X-1,
Y-1;"(G4,G4,G3)";AT X,Y-1;"(G1 G
2 G2)";AT X+1,Y-1;"(G2 G3 G3)";A
T X-1,Y-1;"(G1 G3 G4)"
 900 NEXT F
 910 LET L=L-1
 920 IF L=0 THEN GOTO 940
 930 GOTO 60
 940 PRINT AT 0,22;"PRESS A";AT
1,22;"KEY TO";AT 2,22;"PLAY AGAI
N"
 950 PRINT AT 21,0;"(2*IS)"
 960 FOR N=0 TO 100000
 970 PRINT AT 0,8;SC;AT 0,8;"(5*
IS)"
 980 IF INKEY$<>"" THEN GOTO 100
0
 990 NEXT N
1000 PRINT AT 0,22;"        ";AT
 1,22;"        ";AT 2,22;"
   "
1010 RUN
1020 IF K=3 OR K=4 THEN PRINT AT
 5,11;"(IS)";AT 16,11;"(IS)"
1030 IF K=0 OR K=1 OR K=2 THEN P
RINT AT 5,11;" ";AT 16,11;" "
1040 GOTO 560
1050 IF K=3 OR K=4 THEN PRINT AT
 10,2;"(IS)";AT 11,2;"(IS)";AT 1
0,19;"(IS)";AT 11,19;"(IS)";AT 5
,11;" ";AT 16,11;" "
1060 IF K=0 OR K=1 OR K=2 THEN P
RINT AT 10,2;" ";AT 11,2;" ";AT
10,19;" ";AT 11,19;" ";AT 5,11;"
(IS)";AT 16,11;"(IS)"
1070 GOTO 560
```



RUSSIAN ROULETTE



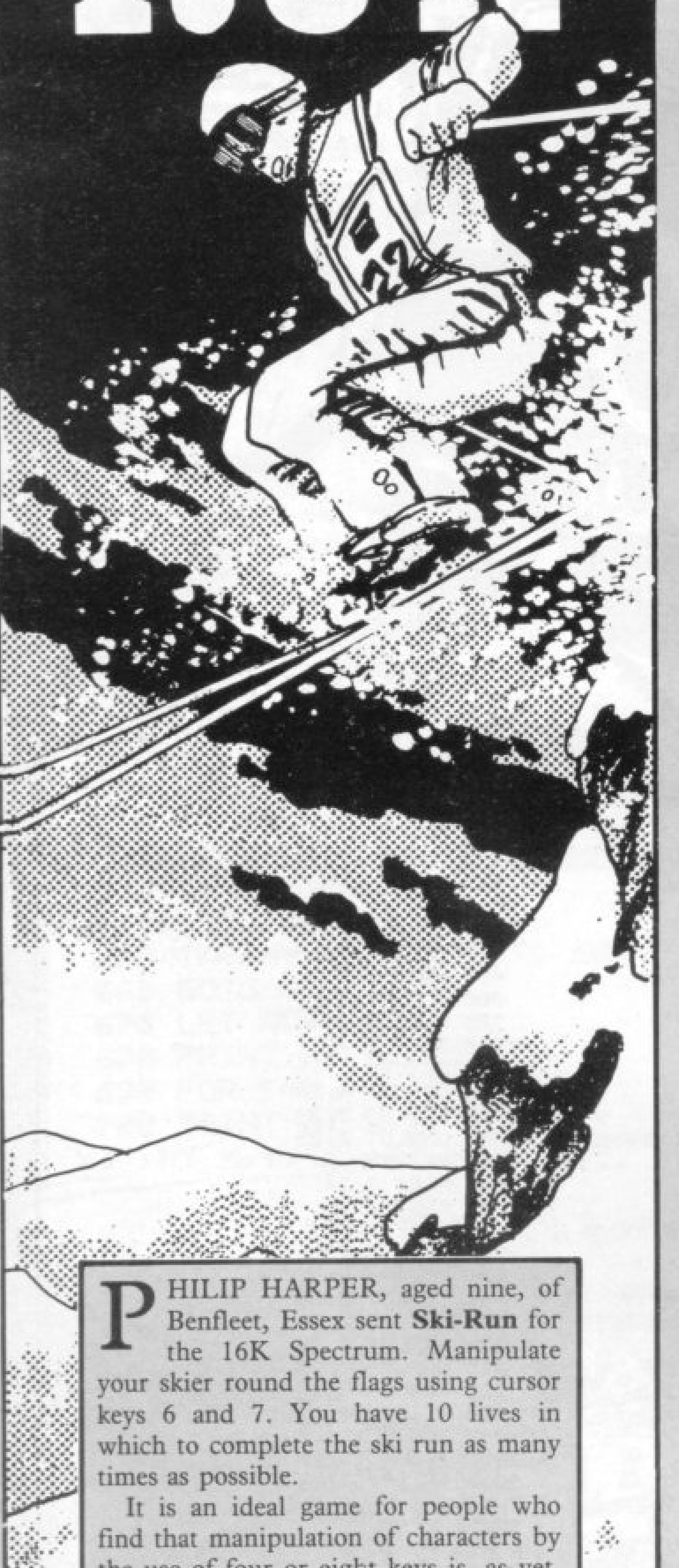
ARE YOUR old gambling programs disenchanting? Has Pontoon become dull and Fruit Machine distasteful? Bring new excitement into your life with **Russian Roulette,** a lethal new game written for the 16K ZX-81 by Martin Winch of St Austell, Cornwall.

On the left of the screen is a gun with eight barrels, on the right is your head. Choose a level. On level one you must fire five shots, on level two six shots, and on level three seven shots. If you choose the incorrect barrel your head is blown off. If, incredibly, you survive, your ZX-81 will ask you politely if you want to play again.

Graphics instructions are given in lower-case letters in brackets. Graphic G is represented by "gg" and graphic F by "gf".

```
   1 CLS
   5 GOSUB 5000
  10 FAST
  12 CLS
  15 LET T=0
  20 LET A=INT (RND*8)+1
  50 FOR I=0 TO 63
  55 PLOT I,43
  57 PLOT I,10
  60 NEXT I
  65 FOR I=10 TO 43
  67 PLOT 0,I
  69 PLOT 63,I
  70 NEXT I
 100 PRINT AT 7,0;"(11*gg)"
 110 PRINT AT 8,0;"(11*gf)"
 115 PLOT 5,25
 120 PLOT 5,24
 125 PLOT 5,23
 130 PLOT 5,22
 135 PLOT 5,21
 140 PLOT 4,21
 150 PLOT 3,21
 155 PLOT 2,21
 157 PLOT 1,21
 160 GOSUB 700
 175 PLOT 2,22
 180 PLOT 62,35
 185 PLOT 61,34
 190 PLOT 60,33
 195 PLOT 59,32
 200 PLOT 58,31
 205 PLOT 57,30
 210 PLOT 57,29
 215 PLOT 57,28
 220 PLOT 57,27
 225 PLOT 57,26
 230 PLOT 57,25
 235 PLOT 57,24
 240 PLOT 57,23
 245 PLOT 58,22
 250 PLOT 59,21
 255 PLOT 60,20
 260 PLOT 61,19
 265 PLOT 62,18
 270 PRINT AT 6,30;"O"
 275 PLOT 62,23
 280 PLOT 56,27
 285 SLOW
 290 PRINT AT 18,0;"WHICH BARREL
?(1 TO 8)"
 295 DIM X$(1)
 300 INPUT X$(1)
 303 IF CODE X$<29 OR CODE X$>36
 THEN GOTO 290
 305 LET T=T+1
 306 PRINT AT 20,0;"TRIES=";T
 307 PRINT AT 21,0;"NUMBERS TRIE
D:"
 308 PRINT AT 21,14+T*2;X$;" "
 317 PRINT AT 18,0;"
                     "
 320 GOSUB 750
 340 GOSUB 800
 345 GOSUB 900
 350 IF A=VAL X$ OR T>=L THEN GO
TO 360
 355 GOTO 290
 360 IF T>=L THEN GOTO 3000
 370 IF A=VAL X$ THEN FOR I=11 T
O 27
 380 PRINT AT 7,I;"."
 390 PRINT AT 7,I;" "
 400 NEXT I
 410 CLS
 420 PRINT "BAD LUCK.ANOTHER GAM
E?"
 430 IF INKEY$="" THEN GOTO 430
 440 IF INKEY$="Y" THEN RUN
 450 GOTO 10000
 700 PLOT 4,24
 705 PLOT 3,23
 710 PLOT 2,22
 720 RETURN
 750 UNPLOT 4,24
 755 UNPLOT 3,23
 760 UNPLOT 2,22
 765 RETURN
 800 PLOT 3,24
 805 PLOT 2,23
 810 PLOT 1,22
 815 PLOT 4,25
 830 RETURN
 900 UNPLOT 3,24
 905 UNPLOT 2,23
 910 UNPLOT 1,22
 915 UNPLOT 4,25
 920 GOSUB 700
 930 RETURN
3000 CLS
3005 PRINT "WELL DONE.";
3008 IF L<7 THEN PRINT "NOW TRY
THE NEXT LEVEL"
5000 PRINT ,,"WHICH LEVEL?(1,2 O
R 3)"
5010 INPUT L
5013 IF L>3 OR L<1 THEN GOTO 501
0
5015 LET L=L+4
5020 RETURN
9990 SAVE "r"
9999 RUN
```

SKI RUN



PHILIP HARPER, aged nine, of Benfleet, Essex sent **Ski-Run** for the 16K Spectrum. Manipulate your skier round the flags using cursor keys 6 and 7. You have 10 lives in which to complete the ski run as many times as possible.

It is an ideal game for people who find that manipulation of characters by the use of four or eight keys is, as yet, beyond them.

4 Graphic S, graphic F
8 Graphic L

```
   1 REM "ski": CLS
   2 LET s=10: PRINT FLASH 1; IN
K 2; PAPER 6;AT 1,5;"PLEASE STOP
 THE TAPE": PRINT AT 2,3;"Press
any key to continue": PAUSE 0
   3 CLS : GO SUB 1000
   4 PRINT AT 1,13;"SKI","Ski is
 a game of skill and it is";"als
o very addictive.            ";"
Use keys 6 & 7 to steer your
";"skier,(⛷),round the flags,(⚑)
.","     You have got 10 lives!":
INK 1: PRINT : PRINT : PRINT "
Press any key to continue": PAUS
E 0
   5 CLS : PRINT AT 10,0;"Skiers
 left";: FOR f=s TO 0 STEP -1: P
RINT INK 1;"⛷ ";: NEXT f: IF s=-
1 THEN GO TO 5000
   6 LET a=1: BORDER 5: PAPER 7:
 INK 2
   7 PRINT BRIGHT 1; PAPER 7; IN
K 2;AT 1,0;"             ⚑       ⚑
   ⚑        ",AT 2,0; BRIGHT 1;
PAPER 7; INK 2;"            ⚑      ⚑
   ⚑        ⚑"
   8 PRINT AT 3,0; INK 0; PAPER
6;"______________________________
____",AT 4,0; PAPER 7;"
        ";AT 0,0; INK 0; PAPER 6
;"_______________________________
__"
   9 PLOT 0,0: DRAW 255,0: DRAW
0,175: DRAW -255,0: DRAW 0,-175
  10 FOR f=1 TO 31
  20 PRINT BRIGHT 1; PAPER 7; IN
K 1;AT a,f;"⛷"
  21 IF (a=1) AND ((f=6) OR (f=1
8) OR (f=27)) THEN GO TO 3000
  22 IF (a=2) AND ((f=4) OR (f=1
3) OR (f=22) OR (f=31)) THEN GO
TO 3000
  25 BEEP .002,f: PRINT AT a,f;
BRIGHT 1; PAPER 7;" "
  26 LET a=a+(INKEY$="6" AND a<2
)-(INKEY$="7" AND a>1)
  30 NEXT f
  35 LET g=g+1
  40 PRINT FLASH 1; PAPER 1; INK
 7;AT 5,10;"WELL DONE!!"
  50 BEEP .1,5: PAUSE 5: BEEP .1
,6: PAUSE 5: BEEP .1,5: PAUSE 5:
 BEEP .1,6: BEEP .9,8
  60 GO TO 5
1000 LET g=0: FOR f=0 TO 7: READ
 z: POKE USR "s"+f,z: NEXT f
1010 FOR f=0 TO 7: READ z: POKE
USR "f"+f,z: NEXT f
1020 FOR f=0 TO 7: READ z: POKE
USR "l"+f,z: NEXT f
1040 FOR f=0 TO 7: READ z: POKE
USR "e"+f,z: NEXT f
1090 RETURN
2000 DATA BIN 00011000,BIN 00011
000,BIN 00010000,BIN 00011111,BI
N 00011010,BIN 00011010,BIN 0001
0001,BIN 11111111
2010 DATA BIN 10000000,BIN 11101
111,BIN 11111110,BIN 11111100,BI
N 11111110,BIN 11111111,BIN 1000
0000,BIN 10000000
2020 DATA 255,0.0,0.0,0,0,255
2040 DATA 0,0,0,BIN 01001001,BIN
 00101010,0,BIN 00101010,BIN 010
01001
3000 FOR q=0 TO 7: PRINT BRIGHT
1; PAPER 7; FLASH 1; INK INT (RN
D*7);AT a,f;"✱"
3010 BEEP .1,-45: NEXT q
3015 LET s=s-1
3016 LET g=g+1
3020 GO TO 60
4000 STOP
5060 PLOT 0,0: DRAW 255,0: DRAW
0,175: DRAW -255,0: DRAW 0,-175:
 PRINT AT 6,7;"Want another go?"
,AT 7,13;"(y/n)"
5065 PRINT AT 1,1,"You finished
with ";g;" runs"
5070 IF INKEY$="y" THEN CLS : LE
T s=10: GO TO 5
5080 IF INKEY$="n" THEN CLS : GO
 TO 4000
5090 GO TO 5070
```

DOTS



JONATHON RANGER, aged 12, has composed a game of chance for two players which can be played on the 16K ZX-81. A grid of dots is printed on the screen and you and your opponent take turns to remove a lot to gain the points it hides. The idea is straightforward but the result remains in doubt throughout the game.

Graphics instructions are listed in lower-case letters in brackets, separated be semi-colons. Spaces are represented by "sp" and inverse spaces by "isp".

```
   1 GOSUB 1000
   2 FAST
   3 CLS
   6 LET K=0
   7 LET J=0
   8 LET F=0
   9 DIM Z(6,10)
  10 PRINT AT 1,0;"  1  2  3  4
 5  6  7  8  9  10"
  20 FOR A=1 TO 6
  30 PRINT AT A*3;0;A;"(sP:isP:2
*sP:isP:2*sP:isP:2*sP:isP:2*sP:i
sP:2*sP:isP:2*sP:isP:2*sP:isP:2*
sP:isP:2*sP:isP:sP)"
  40 NEXT A
  45 FOR A=1 TO 6
  50 FOR B=1 TO 10
  55 LET Z(A,B)=128
  60 NEXT B
  65 NEXT A
  66 SLOW
  70 LET G=F/2
  71 LET H=INT G
  72 IF H=G THEN PRINT AT 21,0;A
$;"          "
  73 IF H<>G THEN PRINT AT 21,0;
B$;"          "
  75 PRINT AT 19,0;"DOWN: "
  80 INPUT X
  85 PRINT AT 20,0;"
               "
  90 IF X>0 AND X<7 THEN GOTO 14
0
  95 PRINT AT 20,0;"OUT OF RANGE
 ENTER AGAIN"
 100 GOTO 80
 140 PRINT AT 19,0;"ALONG: "
 145 INPUT Y
 150 PRINT AT 20,0;"
               "
 160 IF Y>0 AND Y<11 THEN GOTO 1
90
 170 PRINT AT 20,0;"OUT OF RANGE
 ENTER AGAIN"
 180 GOTO 145
 200 IF Z(X,Y)<>128 THEN GOTO 70
 205 LET Z(X,Y)=0
 210 LET E=INT (RND*9)+1
 220 LET C=X*3
 230 LET D=Y*3-1
 240 PRINT AT C,D;E
 250 LET F=F+1
 260 LET G=F/2
 270 LET H=INT G
 280 IF H=G THEN GOTO 310
 290 LET J=J+E
 300 GOTO 320
 310 LET K=K+E
 320 PRINT AT 0,0;B$;" ";K;AT 0,
15;A$;" ";J
 330 IF F<60 THEN GOTO 70
 340 FOR A=1 TO 30
 350 NEXT A
 360 CLS
 370 IF K>J THEN PRINT AT 10,10;
B$;" WON"
 380 IF J>K THEN PRINT AT 10,10;
A$;" WON"
 390 PRINT AT 13,0;"PRESS ANY KE
Y TO RESTART"
 400 IF INKEY$<>"" THEN RUN
 410 GOTO 400
1000 CLS
1010 PRINT "PLEASE ENTER TWO NAM
ES"
1020 PRINT "EACH LESS THAN 9 LET
TERS"
1030 INPUT A$
1040 IF LEN A$<9 THEN GOTO 1070
1050 PRINT "less than 9 letters"
1060 GOTO 1030
1070 INPUT B$
1080 IF LEN B$<9 THEN RETURN
1090 PRINT "less than 9 letters"
1100 GOTO 1070
2000 SAVE "DOTs"
2010 PRINT "ENTER ANY NUMBER"
2020 INPUT Q
2030 RAND Q
2040 RUN
```



CASHFLOW

KAREN CRUICKSHANK of Guildford, Surrey has sent a program for the Spectrum, based on the workings of the Stock Exchange. You are given a working week in which to make as much money as possible by buying and selling stocks and shares. Each day you must decide eight times whether to buy or sell bonds.

Decisions you can make are based on the information given, including how much cash you have in hand and the market forecast. Beware—your boss could arrive at any minute and decide to alter your cashflow situation. It is an original game calling for planning and skill. Can you make sufficient money to be appointed manager at the end of the week?

```
   1 LET HS=0
   3 LET B=10: LET CA=1000: LET
P=10
   5 PAPER 0: INK  : BORDER 0: B
RIGHT 1: CLS
   6 FOR W=1 TO 5: IF W=1 THEN P
RINT "MONDAY"
   7 IF W=2 THEN PRINT "TUESDAY"
   8 IF W=3 THEN PRINT "WEDNESDA
Y"
   9 IF W=4 THEN PRINT "THURSDAY
"
  10 IF W=5 THEN PRINT "FRIDAY"
  14 PRINT FLASH 1'"A NEW WORKIN
G DAY"
  15 POKE 23658,8
  20 FOR Q=1 TO 12: BEEP 0.05,Q:
 NEXT Q
 120 FOR D=1 TO 8
 122 LET RN=INT (RND*10)
 123 GO SUB 2000
 125 PRINT ''"WORKING SEGMENT ";
D
 127 IF P<0 THEN LET P=0
 135 LET Q=INT (RND*5)
 136 PRINT PAPER 6; INK 0;''"REP
ORT:"'
 137 IF CA>=0 THEN PRINT "CASH A
T HAND £";CA
 139 IF CA<0 THEN PRINT "OVERDRA
FT £";CA
 140 PRINT B;" BONDS AT £";P;" E
ACH"
 145 PRINT "OVERALL ASSETS £";(P
*B)+CA
 150 PRINT "MARKET FORCAST ";
 160 IF Q=0 THEN PRINT "STEADY":
 LET P=P+(INT (RND*3)-2)
 170 IF Q=1 THEN PRINT "CHANGEAB
LE": LET P=P+(INT (RND*23)-10)
 180 IF Q=2 THEN PRINT "PLUMMETT
ING": LET P=P+(INT (RND*50)-40)
 190 IF Q=3 THEN PRINT "RISING":
 LET P=P+(INT (RND*50)-15)
 195 IF Q=4 THEN PRINT "UNCERTAI
N!!": LET P=P+(INT (RND*60)-30)
 200 INPUT "SELL OR BUY? ";A$
 210 BEEP 0.05,50
 220 IF A$="SELL" THEN GO TO 500
 230 IF A$<>"BUY" THEN GO TO 200
 240 LET NS=INT (RND*100)+25
 242 PRINT ''"THERE ARE ";ns;" B
ONDS AVAILABLE"
 243 IF P<=0 THEN LET P=1
 245 PRINT "HOW MANY BONDS AT £"
P;" EACH"
 250 INPUT X
 255 BEEP 0.08,50
 257 IF X>NS THEN PRINT ''"I SAID
";NS;" BONDS NOT ";X;" BONDS":
LET NS=NS-1: GO TO 242
 260 IF CA<CA-P*X THEN PRINT "NO
T ENOUGH MONEY": GO TO 240
 279 LET CA=CA-P*X
 290 LET B=B+X
 295 PRINT ''
 304 NEXT D
 306 GO TO 700
 510 LET BU=INT (RND*200)+50
 515 IF P<=0 THEN LET P=1
 520 PRINT '"MARKET PRICE £";P
 525 PRINT BU;" BUYERS WANTING B
ONDS"
 530 PRINT "HOW MANY BONDS TO SE
LL?"
 540 INPUT S
 545 BEEP 0.09,50
 546 IF S>BU THEN PRINT ''"I SAI
D ";BU;" BUYERS": LET BU=BU-1: G
O TO 525
 550 IF S>B THEN PRINT "YOU HAVE
N'T THAT MANY BONDS": GO TO 530
 555 IF S<0 THEN GO TO 525
 560 LET CA=P*S+CA
 595 LET B=B-S
 600 PRINT '': NEXT D
 700 FOR Q=-30 TO 30
 705 BEEP 0.005,Q
 706 NEXT Q
 710 IF W<>5 THEN PRINT ''''"THE
 END OF THE DAY"
 715 IF W=5 THEN PRINT ''''"THE
END OF THE WEEK"
 720 PRINT "CASH ";CA
 730 PRINT B;" BONDS AT £";P
 740 PRINT "TOTAL ASSETS £";: LE
T O=(P*B)+CA: PRINT O
 742 IF W=5 THEN GO TO 749
 745 IF INKEY$="" THEN GO TO 745
 747 CLS : NEXT w
 750 IF O<0 THEN PRINT " YOU'RE
FIRED !!!!!!"
 760 IF O>0 AND O<9000 THEN PRIN
T "YOU DO NOT USE ENOUGH INITIAT
IVE"
 765 IF O>9000 AND O<25000 THEN
PRINT "PROMOTION TO HEAD CASHIER
!!"
 770 IF O>25000 AND O<45000 THEN
 PRINT "PROMOTION TO CHIEF SUPER
VISOR"
 775 IF O>HS THEN LET HS=O
 780 IF O>45000 THEN PRINT "THE
MANAGERS SEAT AWAITS YOU"
 785 PRINT '"HIGH SCORE £";HS
 790 PRINT '''"             PRESS ANY
 KEY"
 800 IF INKEY$="" THEN GO TO 800
 810 CLS : GO TO 2
2010 IF RN=1 THEN PRINT ''"SUDDE
N DEVALUATION HAS MEANT": PRINT
"THAT TWO BONDS ARE BEING MERGED
": PRINT "INTO ONE.IE: CUT IN HA
LF"
2020 IF RN=1 THEN LET B=INT (B/2
)
2025 LET C=INT (RND*3)
2030 IF RN=2 THEN PRINT ''"BOSS
IS COMING AROUND CHECKING.": PAU
SE 100: IF C=0 THEN PRINT "HAD Y
OU WORRIED!!"
2040 IF RN=2 AND C=1 THEN PRINT
"HE CUTS OFF YOUR CASH SUPPLY BY
": PRINT "HALF. (HA,HA,HA)": LET
 CA=CA/2
2050 IF RN=2 AND C=2 THEN PRINT
"GIVES YOU EXTRA 100 BONDS.": LE
T B=B+100
2100 RETURN
```

```
   1 PRINT " I WILL CREATE A MAG
IC SQUARE OF ANY NUMBER YOU ENTE
R BETWEEN 34 AND 100"
   2 INPUT C
   3 IF C<34 OR C>100 OR INT C<>
C THEN GOTO 2
   5 FAST
   6 LET A$="(sP:9e:2*97:9e:2*97
:9e:2*97:9e:2*97:95)"
   7 PRINT ,,A$,,"(sP:95:8:sP:95
:11:95)";C-20;"(95:1:sP:95)"
   8 PRINT A$,,"(sP:95)";C-21;"(
95:2:sP:95:7:sP:95:12:95)"
   9 PRINT A$,,"(sP:95:3:sP:95)"
;C-18;"(95:9:sP:95:6:sP:95)"
  10 PRINT A$,,"(sP:95:10:95:5:s
P:95:4:sP:95)";C-19;"(95)",,"(sP
:12*97:91)",,"MAGIC SQUARE OF ";
C
  11 SLOW
  12 PAUSE 4E4
  13 CLS
  14 RUN
```

HERE IS a simple program written for the 1K ZX-81 by Angus Lavery of Todmorden, Lancashire for generating magic squares. The program not only generates a magic square of any number you care to enter between 34 and 100 but also ensures that all rows and columns add up to your number and that long diagonals, any block of numbers in a 2 × 2 square in the large square, the four corners, the top and bottom centre numbers, and the left and right centre numbers, all add to your original number.

Graphics instructions are, as usual, given in brackets in lower-case letters separated by colons. A space is represented by "sp" and a graphics character by "g". Thus "ge" stands for graphic "e", and "g7" for graphic "7".





DEATH RUN

YOU ARE going quietly about your daily business, mending a sewer, when you notice that the water below you is rising steadily.

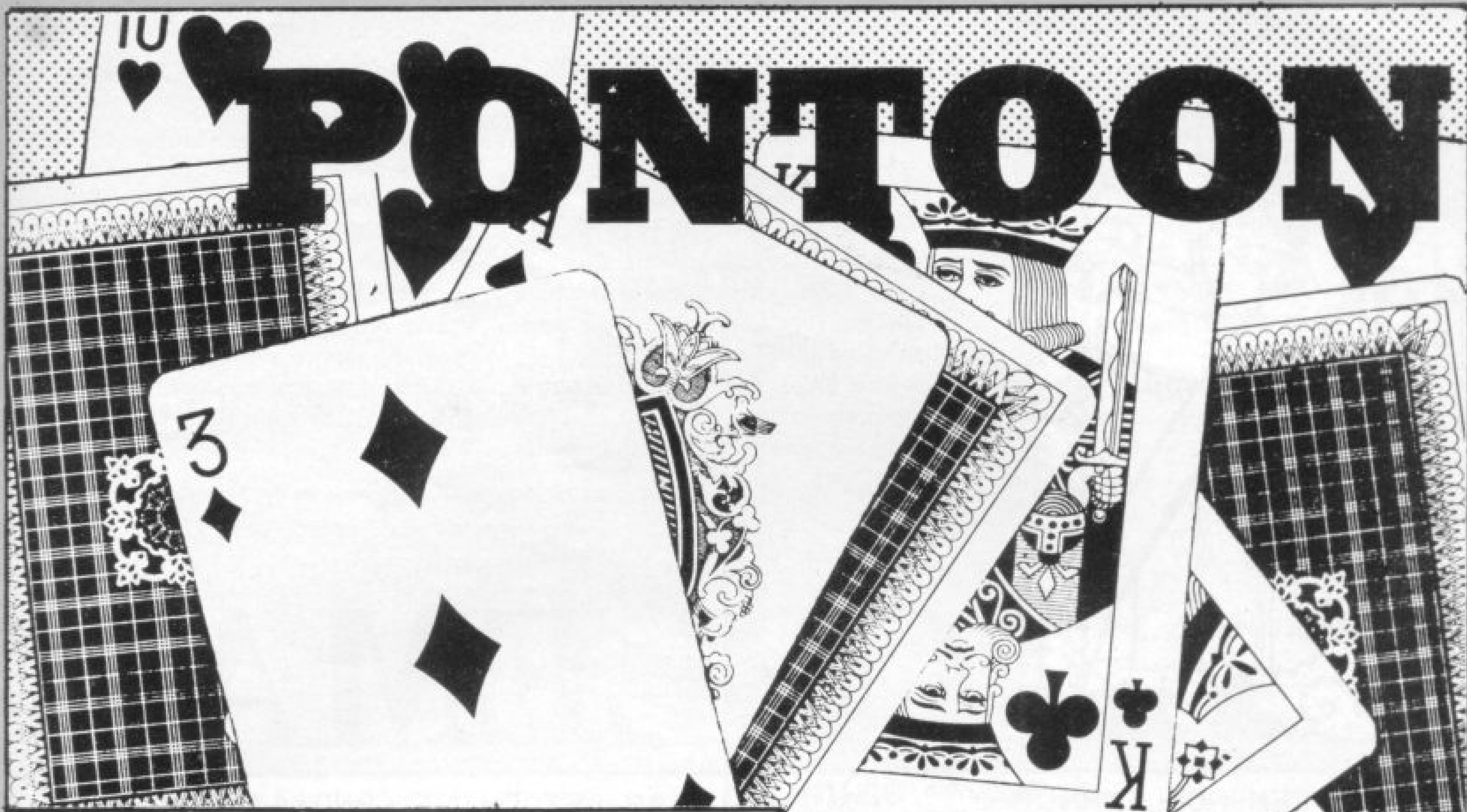
You have left 10 tools in the hole at the end of each level, which you must collect to gain extra points, and you must then run to the far end of the ground level, without drowning, to win.

Move left and right with cursor keys 5 and 8 and climb the ladder by pressing 0 once. The game was written for the 16K Spectrum by Danny Perri of Ongar, Essex.

Graphics: 10-gA: 33-g3, inverse g3, 30*g3: 53-gE, gH: 55-gI: 56-gG, gD: 301-sp, gE, gF: 306-96*g8

```
   1 LET HS=0: LET N$=""
   5 GO SUB 3000
  10 FOR f=USR "A" TO USR "O"-1
  20 READ x: POKE f,x: NEXT f
  29 INPUT "DIFFICULTY (1-9)?";D
IF: LET S=0: LET DIF=DIF/100: IF
 DIF>=.1 THEN GO TO 34
  30>LET T=10: LET d=1: LET a=0:
 LET w=20
  31 PAPER 4: INK 7: CLS
  32 FOR F=5 TO 20 STEP 4
  33 LET a$="▀▀▄▄████████████████████"
  35 IF F<7 THEN LET A$(2)="▀"
  40 PRINT AT f,0;a$: NEXT f: FO
R f=3 TO 20: PRINT AT f,27;"H":
 NEXT f
  50 LET p=2: LET h=15
  52 IF p=27 AND INKEY$="0" THEN
 GO SUB 300
  53 IF d=1 AND a=0 THEN LET b$=
" "
  54 IF d=1 AND a=1 THEN LET b$=
" "
  55 IF d=-1 AND a=1 THEN LET b$
=" "
  56 IF d=-1 AND a=0 THEN LET b$
=" "
  57 LET a=a+1: IF a>1 THEN LET
a=0
  60 PRINT AT h,p-1;" ♀ "; INK
2;AT h+1,p-1;" ";b$;" "
  70 IF INKEY$="8" AND P<29 THEN
 LET d=1: LET p=p+1
  75 IF INKEY$="5" AND P>2 THEN
 LET d=-1: LET p=p-1
  76 IF INKEY$="" THEN LET d=0
  80 PRINT INK 1;AT w,0;"████████
████████████████████████": LET
w=w-DIF: IF w<15 THEN LET DIF=DI
F+0.005
  90 IF w<h-1 THEN GO TO 9e3
  95 IF W<6 THEN LET W=6
 100 IF h=3 AND p=2 THEN GO TO 5
00
 110 PRINT AT 0,5;"SC:";S;AT 0,1
2;"HS:";HS;" ";N$
 120 IF H>6 AND T>0 AND A$(p)="▄
" THEN LET S=S+2: LET T=T-1: PRI
NT AT H+1,P-1;"/": BEEP .0625,0:
 PRINT AT H+1,P-1;" ";AT H,P+2;"
!"
 190 GO TO 52
 300 FOR f=1 TO 4
 301 IF a=0 THEN LET b$=" "
 302 IF a=1 THEN LET b$=" "
 304 LET a=a+1: IF a>1 THEN LET
a=0
 305 PRINT AT h,p;"♀"; INK 2;AT
 h+1,p;b$; INK 7;AT h+2,p;"H":
BEEP .125,-1: BEEP .125,3: LET h
=h-1: NEXT f
 306 LET W=W-DIF: PRINT INK 1;AT
 W,0;"█████████████████████████
████████████████████████████████
█████████"
 307 PRINT AT h+2,p;"H": LET T=
10
 310 GO TO 52
 500 BEEP .25,22: BEEP .125,22:
BEEP .125,17: BEEP .25,14: BEEP
.25,10: BEEP .5,22
 505 IF S>=HS THEN LET HS=S: CLS
 : PRINT "YOU'VE GOT THE BEST SC
ORE !"," INPUT YOU'RE NAME.": IN
PUT N$
 510 CLS : FOR F=1 TO 20: PRINT
">>>";N$;" WELL DONE<<<": NEXT F
 520 PRINT AT 20,5;"ANOTHER GO?
(Y/N)": INPUT G$: IF G$="N" THEN
 STOP
 530 GO TO 29
1000 DATA 3,3,12,12,3,1,127,127
1001 DATA 192,192,48,48,192,128,
254,254
1002 DATA 3,3,15,15,48,48,192,19
2
1003 DATA 192,192,192,192,192,19
2,192,192
1004 DATA 3,3,3,3,3,3,3,3
1005 DATA 192,192,240,240,12,12,
3,3
1006 DATA 3,3,63,63,192,192,0,0
1007 DATA 192,192,252,252,3,3,0,
0
1008 DATA 3,3,15,15,48,48,48,48
1009 DATA 192,192,192,192,252,25
2,0,0
1010 DATA 3,3,3,3,63,63,0,0
1011 DATA 192,192,240,240,12,12,
12,12
1012 DATA 48,48,63,63,48,48,63,6
3
1013 DATA 12,12,252,252,12,12,25
2,252
3000 PRINT '"              DEATH RUN
     "''"YOU ARE AT THE B
OTTOM OF A      FLOODING SEWER M
AKING REPAIRS,   WHEN YOU NOTICE
THE WATER LEVEL RISING YOU MUST
GET OUT QUICKLY OR DROWN."
3001 PRINT ''"DONT FORGET TO GET
 YOUR TOOLS!"
3002 PRINT '"      5....LEFT": PRI
NT "    8....RIGHT": PRINT "    0.
.....UP"
3005 PRINT AT 20,3;"HIT A KEY...
": PAUSE 0: CLS : RETURN
9000 PRINT " YOU DROWNED    "
9005 BEEP .5,-12: BEEP .5,-12: B
EEP .25,-7: PAUSE 1: BEEP .75,-1
2: BEEP .5,-7: BEEP .25,-9: BEEP
 .5,-12
9010 GO TO 520
```

PONTOON



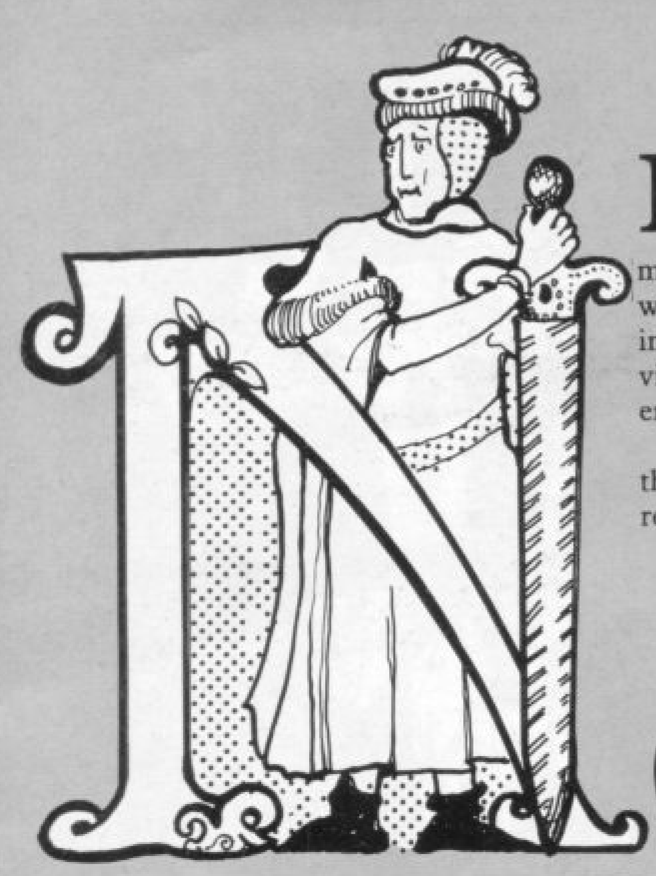


```
   1 LET S=NOT PI
   2 LET M=NOT PI
   5 PRINT " (g5)YOU(g8)"
  10 LET C$="ace  TWO  THREEFOUR FIVE SIX  SEVENEIGHTNINE TEN  jack queenking "
  20 GOSUB VAL "200"
  30 LET S=VAL "S"+VAL "C"
  35 IF VAL "S">VAL "21" THEN PRINT ">BUST<";Q
  40 GOTO VAL "40"+(VAL "-20" AND INKEY$="1")+(VAL "60" AND INKEY$="0")
 100 PRINT
 105 PRINT " (g5)ME(g8)"
 110 GOSUB VAL "200"
 120 LET M=VAL "M"+VAL "C"
 130 IF VAL "M">VAL "21" THEN PRINT ">BUST<";Q
 140 IF VAL "M">=VAL "17" THEN GOTO VAL "300"
 150 GOTO VAL "110"
 200 LET C=INT (RND*VAL "13")
 210 LET P=VAL "C"*VAL "5"+SGN PI
 220 PRINT " ";C$(VAL "P" TO VAL "P"+VAL "4")
 230 IF VAL "C">VAL "9" THEN LET C=VAL "9"
 235 LET C=VAL "C"+SGN PI
 240 RETURN
 300 PRINT TAB 11
 310 IF VAL "S">VAL "M" THEN PRINT "--YOU WIN--";Q
 320 IF VAL "S"<VAL "M" THEN PRINT "++I WIN++";Q
 330 PRINT "XXTIEXX"
```

CARL JOHANSON has managed to fit the game of **Pontoon** into a program for the 1K ZX-81. The game is necessarily very simple; there are no suits, and no five-card tricks. The basics are all there, though, and the game remains enjoyable.

You play the computer who, as banker, always wins in case of a tie. The winner is the player with cards totalling 21, or the nearest lower number. Anyone with cards totalling more than 21 busts and loses the round. You take cards by pressing "1". When you have sufficient cards, press "0" and the computer will select its cards.

Graphics instructions are given in lower-case letters in brackets. "g5" represents graphic 5, and "g8" represents graphic 8.



OBLEMAN

FOR THIS adventure game, set in mediaeval England, you are transformed into a nobleman. You must struggle to survive in a society where the king rules supreme and falling out of favour can mean ruin, where violence and rebellion are the rule rather than the exception.

You could depose the king and rule the country but you will find that his resources are usually greater than yours and he does not look kindly on rebellious subjects.

All women programmers will be faced with an enforced sex-change, which is difficult to remove without changing large amounts of the program. It is a problem for potential adventure programmers to avoid.

This program was written for the 16K ZX-81 by John Barnes of Swindon, Wiltshire.

```
   2 REM NOBLEMAN
   4 PRINT AT 8,6;"*************
******";AT 9,6;"*
  *";AT 10,6;"* N O B L E M A N
*";AT 11,6;"*                 *"
;AT 12,6;"*******************"
   6 FOR X=0 TO 200
   7 NEXT X
   8 CLS
  10 PRINT AT 2,0;"IN THIS GAME
YOU ARE THE HEAD OF A NOBLE FAMI
LY."
  12 PRINT AT 5,0;"IT IS YOUR AI
M TO SURVIVE THE SCHEMING AND PL
OTTING OF THE OTHER NOBLES."
  14 PRINT AT 9,0;"IF POSSIBLE Y
OU ARE TO INCREASE YOUR FAVOUR A
ND STRENGHT POINTS.YOU MIGHT EVE
N BE ABLE TO DEPOSE THE KING."
  16 PRINT AT 14,0;"IF YOUR FAVO
UR POINTS FALL BELOW 0,THE KING
IS LIABLE TO GET ANGRY.IF YOUR S
  18 PRINT AT 21,0;"TYPE ANY KEY
 TO CONT."
  20 IF INKEY$="" THEN GOTO 20
  22 CLS
  30 PRINT "YOUR NAME PLEASE."
  35 INPUT N$
  40 LET T$="SIREARLDUKE"
  45 LET T=RND*10
  50 IF T<=4 THEN LET Z$=T$(1 TO
 3)
  55 IF T>4 AND T<=7 THEN LET Z$
=T$(4 TO 7)
  60 IF T>7 AND T<10 THEN LET Z$
=T$(8 TO 11)
  70 LET A=INT (RND*30)+20
  80 LET M=RND*10
  85 IF M<5 THEN LET M=0
  90 IF M>=5 THEN LET M=1
 100 LET S=INT (RND*4)
 110 LET D=INT (RND*4)
 112 IF M=0 THEN LET D=0
 114 IF M=0 THEN LET S=0
 120 IF Z$="SIR" THEN LET B=4
 130 IF Z$="EARL" THEN LET B=6
 135 IF Z$="DUKE" THEN LET B=8
 140 LET F=10
 150 LET O=0
 160 LET Y=0
 165 GOSUB 500
 170 LET O=O+1
 180 IF O=13 THEN LET Y=Y+1
 185 IF O=13 THEN LET A=A+1
 190 IF O=13 THEN LET O=1
 195 CLS
 220 LET G=INT (RND*100)
 230 IF G>=0 AND G<=24 THEN GOSU
B 700
 240 IF G>=35 AND G<=49 THEN GOS
UB 800
 250 IF G>=50 AND G<=64 THEN GOS
UB 900
 260 IF G>=65 AND G<=69 THEN GOS
UB 1000
 270 IF G>=70 AND G<=74 THEN GOS
UB 1150
 280 IF G>=75 AND G<=79 THEN GOS
UB 1250
 290 IF G>=80 AND G<=89 THEN GOS
UB 1600
 300 IF G>=90 AND G<=99 THEN GOS
UB 1400
 310 IF G>=25 AND G<=34 THEN GOS
UB 1700
 320 IF F<0 THEN GOSUB 2100
 330 IF B<0 THEN GOSUB 2200
 335 GOSUB 500
 340 GOTO 170
 500 CLS
 505 PRINT AT 1,0;"YEAR ";Y;" MO
NTH ";O
```

```
 510 PRINT AT 3,0;"YOU ARE ";Z$;
" ";N$
 520 IF M=1 THEN PRINT AT 5,0;"Y
OU ARE MARRIED."
 525 IF M=0 THEN PRINT AT 5,0;"Y
OU ARE UN-MARRIED."
 530 PRINT AT 7,0;"YOU HAVE ";S;
" SONS AND ";D;" DAUGHTERS."
 540 PRINT AT 9,0;"YOU ARE ";A;"
YEARS OLD."
 550 PRINT AT 11,0;"YOU HAVE ";B
;" STRENGTH POINTS.";AT 13,0;"YO
U HAVE ";F;" FAVOUR POINTS."
 553 PRINT AT 15,0;"TYPE ANY KEY
 TO CONT."
 556 IF INKEY$="" THEN GOTO 556
 558 CLS
 560 RETURN
 710 PRINT "NOTHING HAPPENED THI
S MONTH."
 720 PRINT AT 5,0;"YOU MAY DO NO
THING(D),REVOLT(R) OR QUARREL(Q)
."
 725 FOR X=0 TO 1000
 730 IF INKEY$="D" THEN RETURN
 740 IF INKEY$="R" THEN GOSUB 19
00
 750 IF INKEY$="Q" THEN GOSUB 18
00
```



```
 755 NEXT X
 760 RETURN
 800 PRINT "YOU HAVE FALLEN OUT
OF THE KINGS FAVOUR."
 810 PRINT AT 3,0;"YOU MAY DO NO
THING(D),GIVE KING 1 STRENGTH PT
(G) OR REVOLT(R)."
 812 FOR X=0 TO 1000
 815 IF INKEY$="D" THEN LET F=F-
2
 820 IF INKEY$="G" THEN LET B=B-
1
 824 IF INKEY$="D" OR INKEY$="G"
 THEN RETURN
 825 IF INKEY$="R" THEN GOSUB 19
00
 828 NEXT X
 830 RETURN
 900 PRINT "YOU HAVE FALLEN INTO
 KINGS FAVOUR."
 910 PRINT AT 3,0;"YOU MAY DO NO
THING(D) OR REVOLT(R)."
 915 LET F=F+2
 918 FOR X=0 TO 1000
 920 IF INKEY$="D" THEN RETURN
 930 IF INKEY$="R" THEN GOSUB 19
00
 935 NEXT X
 940 RETURN
1000 IF M=0 THEN GOSUB 700
1005 IF M=0 THEN RETURN
1010 LET P=INT (RND*10)
1020 IF P>=5 THEN LET S=S+1
1030 IF P<5 THEN LET D=D+1
1040 PRINT "YOUR WIFE HAS GIVEN
BIRTH TO A "
1050 IF P>=5 THEN PRINT AT 3,4;"
SON"
1060 IF P<5 THEN PRINT AT 3,4;"D
AUGHTER"
1070 PRINT AT 5,0;"YOU MAY DO NO
THING(D),QUARREL(Q) OR REVOLT(R)
."
1075 FOR X=0 TO 1000
1080 IF INKEY$="D" THEN RETURN
1090 IF INKEY$="Q" THEN GOSUB 18
00
1100 IF INKEY$="R" THEN GOSUB 19
00
1105 NEXT X
1110 RETURN
1150 IF M=0 THEN PRINT "YOU HAVE
 GOT MARRIED."
1160 IF M=0 THEN LET M=M+1
1170 GOSUB 720
1180 RETURN
1250 LET H=INT (RND*10)
1260 IF H=4 OR H=8 THEN PRINT "Y
OU HAVE DIED OF THE PLAGUE."
1265 IF H=4 OR H=8 THEN GOSUB 20
00
```

```
1270 IF H=1 AND M=1 OR H=5 AND M
=1 OR H=9 AND M=1 THEN PRINT "YO
UR WIFE HAS DIED OF THE PLAGUE."
1275 IF H=1 AND M=1 OR H=5 AND M
=1 OR H=9 AND M=1 THEN LET M=0
1280 IF H=0 AND S>0 OR H=7 AND S
>0 THEN PRINT "YOUR SON HAS JUST
 DIED OF THE PLAGUE."
1295 IF H=0 AND S>0 OR H=7 AND S
>0 THEN LET S=S-1
1300 IF H=2 AND D>0 OR H=3 AND D
>0 OR H=6 AND D>0 THEN PRINT "YO
UR DAUGHTER HAS JUST DIED OF THE
 PLAGUE."
1305 IF H=2 AND D>0 OR H=3 AND D
>0 OR H=6 AND D>0 THEN LET D=D-1
1310 GOSUB 720
1330 RETURN
1400 LET W$="PEASANT REVOLTWELSH
 REBELLIONSCOTTISH RAID"
1410 LET J=INT (RND*10)
1413 PRINT "YOU HAVE BEEN ASKED
BY THE KING TO SURPRESS A "
1415 IF J=0 OR J=3 OR J=6 OR J=9
 THEN PRINT AT 4,0;W$(1 TO 14)
1420 IF J=1 OR J=4 OR J=7 THEN P
RINT AT 4,0;W$(15 TO 29)
1425 IF J=2 OR J=5 OR J=8 THEN P
RINT AT 4,0;W$(30 TO 42)
1430 PRINT AT 6,0;"YOU MAY ACCEP
T(A),REFUSE(N) OR REVOLT(R)."
1432 FOR X=0 TO 1000
1435 IF INKEY$="A" THEN GOTO 144
0
1436 IF INKEY$="R" THEN GOSUB 19
00
1437 IF INKEY$="N" THEN GOTO 151
5
1438 NEXT X
1439 RETURN
1440 LET K=INT (RND*10)
1445 IF K=3 OR K=7 THEN PRINT AT
 10,0;"YOU WERE BEATEN.THE KING
ISNT PLEASED."
1448 IF K=3 OR K=7 THEN LET F=F-
2
1500 IF K<>3 AND K<>7 THEN PRINT
 AT 10,0;"YOU WON.THE KING IS PL
EASED."
1505 IF K<>3 AND K<>7 THEN LET F
=F+2
1507 FOR X=0 TO 150
1508 NEXT X
1510 RETURN
```



```
1515 PRINT AT 10,0;"THE KING ISN
T PLEASED."
1520 LET F=F-4
1530 FOR X=0 TO 150
1535 NEXT X
1540 RETURN
1600 FOR X=0 TO 1000
1603 PRINT "ANOTHER NOBLE HAS PI
CKED A QUARREL WITH YOU.DO YOU B
ACK DOWN(B) OR FIGHT(F)."
1605 FOR X=0 TO 1000
1610 IF INKEY$="B" THEN LET F=F+
1
1620 IF INKEY$="F" THEN GOSUB 18
00
1625 NEXT X
1630 RETURN
1700 PRINT "YOU HAVE BEEN ASKED
TO JOIN A REVOLT. ANS YES(Y) OR
NO(N)."
1705 FOR X=0 TO 1000
1710 IF INKEY$="Y" THEN GOSUB 19
00
1715 IF INKEY$="N" THEN RETURN
1718 NEXT X
1720 RETURN
1800 CLS
1805 PRINT AT 3,0;"YOUR FACTION"
,"THEIR FACTION"
1810 LET L=B+INT ((RND*5)*(RND*1
```

```
0))
1815 LET V=INT ((RND*6)*(RND*10)
)
1820 PRINT AT 5,0;L,V
1825 LET U=0
1830 IF L>=1.5*V THEN LET U=1
1835 IF V>=1.5*L THEN LET U=2
1840 IF U=1 THEN LET B=B+3
1845 IF U=1 THEN PRINT AT 10,0;"
YOU WON."
1850 IF U=2 THEN LET B=B-3
1855 IF U=2 THEN PRINT AT 10,0;"
YOU LOST."
1860 IF U=0 THEN PRINT AT 10,0;"
QUARREL UNRESOLVED."
1868 FOR X=0 TO 200
1869 NEXT X
1870 RETURN
1900 CLS
1905 LET F=-1
1910 LET L=B+INT ((RND*5)*(RND*1
0))
1920 LET V=INT ((RND*10)*(RND*10
))
1930 PRINT "YOUR FACTION","KINGS
 FACTION",L,V
1940 IF L>=1.5*V THEN PRINT AT 6
,0;"CONGRATULATIONS,YOU HAVE DEP
OSED THE KING."
1950 IF V>=1.5*L THEN PRINT AT 6
,0;"HARD LUCK,THE REVOLT WAS CRU
SHED. YOU WERE EXECUTED, AND ALL
 YOUR LANDS WERE TAKEN."
1960 IF L>=1.5*V OR V>=1.5*L THE
N STOP
1970 PRINT AT 6,0;"THE REVOLT PE
TERED OUT."
1975 FOR X=0 TO 200
1978 NEXT X
1980 RETURN
2000 FOR X=0 TO 100
2001 NEXT X
2002 CLS
2005 PRINT "WHAT A PITY, YOU HAV
E JUST DIED."
2010 IF S=0 THEN PRINT AT 3,0;"A
S YOU HAVE NO SON, YOUR LANDS PA
SS OUT OF YOUR FAMILY."
2015 IF S=0 THEN STOP
2020 PRINT AT 3,0;"THE INHERITAN
CE GOES TO YOUR SON.";AT 5,0;"IN
PUT HIS NAME."
2030 INPUT N$
2035 LET A=A-20
2040 LET M=0
2042 LET S=0
2046 LET D=0
2050 RETURN
2100 LET R=INT (RND*10)
2103 CLS
2110 PRINT "THE KING IS ANGRY WI
TH YOU."
2120 IF R=0 OR R=8 THEN PRINT AT
 5,0;"LUCKILY YOU WERE PADONED."
2125 IF R=0 OR R=8 THEN LET F=0
2130 IF R=2 OR R=7 THEN PRINT AT
 5,0;"YOU WERE STRIPPED OF YOUR
LANDS."
2135 IF R=2 OR R=7 THEN LET B=0
2140 IF R=1 OR R>=3 AND R<=6 OR
R=9 THEN GOTO 2150
2142 FOR X=0 TO 150
2143 NEXT X
2145 RETURN
2150 PRINT AT 6,0;"YOU WERE EXEC
UTED AND YOUR LANDS WERE CONFISC
ATED."
2160 STOP
2200 CLS
2205 PRINT "WHAT A PITY, YOU ARE
 IN DEBT.ALL YOUR TITLES ARE STR
IPPED AWAY AND YOU BECOME A COMM
ONER."
2210 STOP
```



Tug o' War

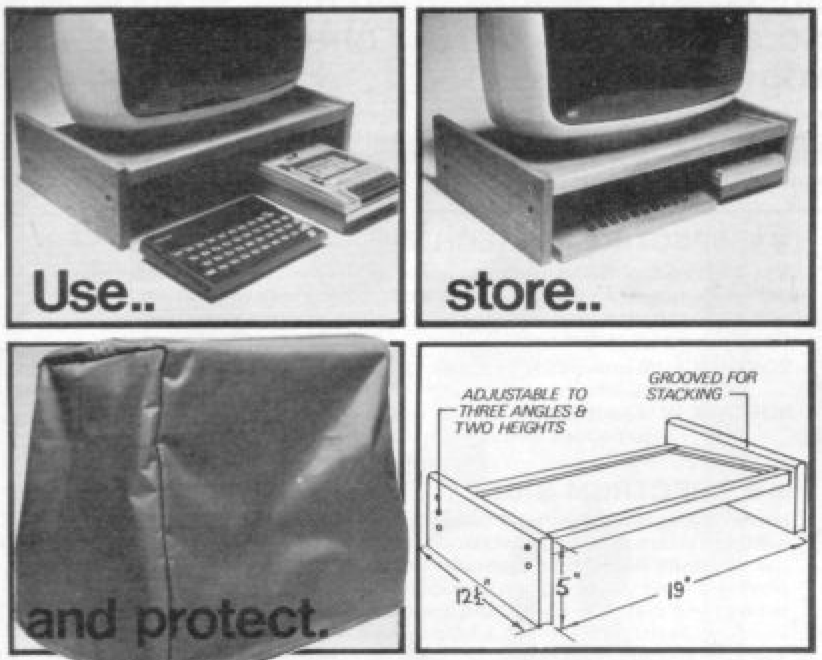
```
  10 INK 0: BORDER 0: PAPER 6: CLS
  12 FOR n=USR "a" TO USR "a"+31: READ d: POKE n,d: NEXT n
  13 DATA 0,0,0,254,0,0,0,0
  14 DATA 0,0,0,126,0,0,0,0
  15 DATA 192,d,128,-1,240,112,28,7
  16 DATA 3,d,1,-1,15,14,56,224
  20 PLOT 119,168: DRAW 17,0: DRAW 0,-9: DRAW -17,0: DRAW 0,9
  25 PRINT PAPER 2;AT 1,15;"  "
  30 PLOT 0,153: DRAW 255,0
  31 PLOT 0,152: DRAW 255,0
  35 FOR n=8 TO 14: PRINT AT n,15;"[graphics]"
  40 NEXT n
  45 LET sx=0: LET sy=0
  50 LET a$=" [graphics] "
  60 PRINT AT 20,2;sx;TAB 13;"SCORE";TAB 29;sy
  70 LET z=6
  80 PRINT AT 11,z;a$
 120 FOR c=5 TO 0 STEP -1: PRINT AT 0,0;c,AT 0,31;c: PAUSE 20: NEXT c
 130 PRINT AT 11,z;a$
 140 IF z>10 OR z<2 THEN GO TO 210
 150 LET c=2+2*(RND>.6)
 160 PRINT PAPER c;AT 1,15;"  "
 170 LET x=IN 64510: LET y=IN 57342
 180 IF x<>190 AND y<>190 THEN GO TO 170-20*(RND<.1)
 190 LET z=z+(x=190 AND c=2)+(y=190 AND c=4)-(x=190 AND c=4)-(y=190 AND c=2)
 200 GO TO 130
 210 LET sx=sx+(z<2): LET sy=sy+(z>10)
 215 FOR j=1 TO 10: PRINT AT 11,z+1;"******************": PAUSE 5: PRINT AT 11,z+1;"##################": PAUSE 5: NEXT j
 225 PRINT AT 20,2;sx;AT 20,29;sy
 230 PRINT AT 11,1;"  Press any key to re-start   "
 240 PAUSE 0
 245 PRINT AT 11,3;"                              "
 250 GO TO 70
```

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The program was written for the 16K Spectrum by S A Fisk of Bridgend, Mid-Glamorgan.

Graphic notes:
35 Inverse graphic 1, graphic 7
50 4*graphic C, 10*graphic A, 4*graphic D





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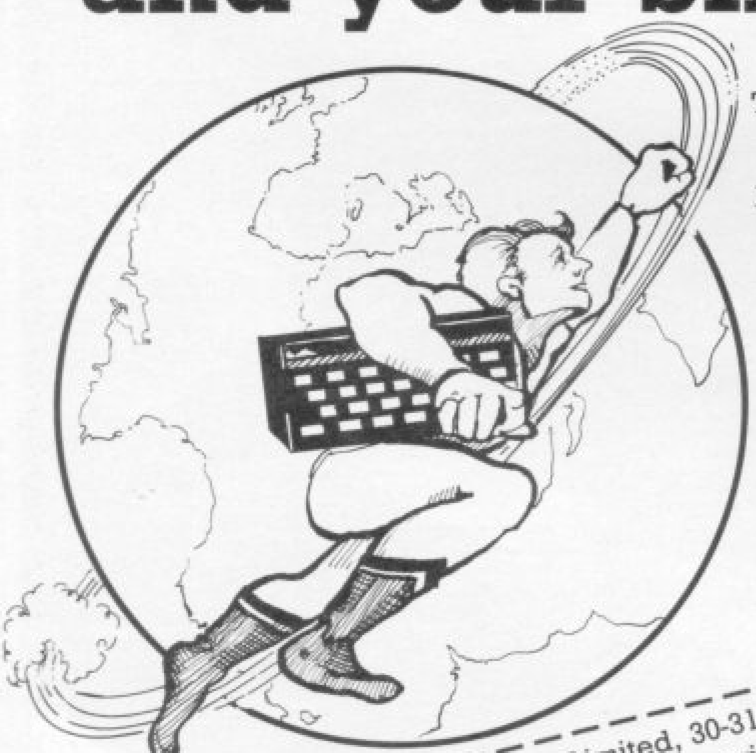
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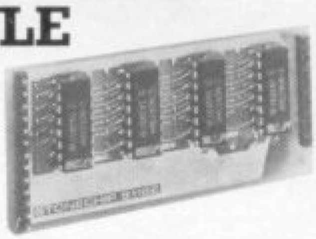


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Our second User of the Month discovered how to transmit programs over his CB radio. Claudia Cooke talks to Alan Howell about his growing interest in Sinclair computers.

Spectrum finds a good buddy



ALAN HOWELL sat in his West London home staring at his television screen in amazement. What he saw was not unusual, since it was a games program he had used many times previously on his Spectrum. This time the tape was in a friend's home and Howell had just received the program via CB radio.

"I was absolutely staggered", says 23-year-old Howell. "I have had CB radio for about a year and I was using it to talk to a friend one evening when suddenly he said we should have a game on our Spectrums.

"We were both joking but he transmitted it and there it was on the screen. He just did not believe me until he had played a few moves and I had responded. It was amazing; I was intrigued".

Since that evening, just before Christmas, Howell and his friend have followed their astonishing discovery with a host of programs over the air, including the time Howell was able to write a birthday greeting to appear on a friend's television screen.

Their discovery has opened a world of new possibilities for Howell and his CB friends, including the fact that programs can be shared simultaneously with as many people as can hear them.

Being a somewhat more experienced Spectrum user than some of his friends, Howell is often asked to collect a friend's tape and iron-out the problems. Now he can do that without even leaving home — and tapes can be shared and borrowed in the same manner.

> 'I wanted a really good calculator and that is what I thought I was buying. I admit when I first took it home and realised it was a computer I was really annoyed'.

How is it done? Instead of plugging the Spectrum into the tape recorder, you plug it into the CB amplifier, which is able to relay the signal instead of the tape recorder.

Having done that, Howell found that it was impossible to hear what the other person was saying. He overcame the difficulty by using an external speaker and amplifier. The cassette recorder he uses for saving programs has a built-in amplifier, so it is possible to hear what is being recorded. All he had to do was to connect the MIC socket of the Spectrum to the cassette recorder in the usual manner for saving programs and the sound emerged from CB clearly.

All that remained was to type-in, load and press enter, with fingers crossed for good measure.

The joy of the operation is that it does not need a computer genius. In fact, when Howell bought his first personal computer two years ago, a ZX-81, his knowledge of computers was so minimal that he says:

"I wanted a really good calculator and that is what I thought I was buying. I admit when I first took it home and realised it was a computer I was really annoyed; I thought it was a total waste of money. Then I read the manual, just for interest, and within two or three hours I was writing a program".

Since that day, he has written numerous programs and has swapped his ZX-81 for a Spectrum, which he loves.

Having spent four years studying hotel management, Howell became ill six weeks after taking his first job and he has been unemployed since then but the time has been well spent. He decided to take a correspondence course in accountancy and says:

"I was writing programs for equations and for doing my accounts and the computer really helped me. I am hopeless at studying on my own but when you have a computer it becomes more of a game — it becomes fun".

When he decided to buy a CB radio set, he again admits total ignorance of what he was starting.

"I knew nothing about it, except that I thought you had to have all this sophisticated lingo or no-one would understand you. I was really surprised to hear people talking normally. Being ill for so long, the CB and the Spectrum have really helped me to keep my sanity. With the CB I have made a group of new friends".

In addition to his new-found technical skills, Howell is a member of the elite Magic Circle, having been a dedicated magician since the age of six.

"I gave my first public performance when I was 12, for the Scouts. Then I started to receive a number of bookings and I joined the Magic Circle when I was 18. I do not do it for money any



more but I still do it for my friends — you know, cutting them in half and that kind of thing".

Not content with such a bizarre range of activities, he is also a talented amateur musician, playing the organ, piano, guitar, piano accordion and the harpsichord.

He has played the organ at his local church, St. Paul's in Hounslow West, for the last seven years and owns his own organ, guitar and piano accordion. He admits:

"I have never been so busy in my life. I seem to have less time to myself now than ever before and I am never bored".

His enthusiasm for computers is now so great that, having sailed through his hotel management training and assumed that would be his career, he has now done an about-turn in favour of learning to be a computer programmer.

"I realise that my knowledge is amateur but I plan to go back to college and study computers seriously and get a job in that field afterwards. I find the world of computers completely absorbing; they have the potential to affect almost everything we do and programming them would be a real challenge".

Howell is also keen to persuade other Sinclair users to invest in a CB radio set — he says it will cost less than £50 — and discover the fascination of using it to transmit programs.

He has made several improvements to his initial discovery in the last few weeks. One is that the sender of the program should plug a speaker into the MIC socket and keep the CB microphone as close to it as possible. That allows the recipient to control the volume output from CB to Spectrum.

He recommends beginning with short programs — about 10 or 20 lines — to minimise the chance of outside interruptions which would prevent your program loading.

The radius of a CB set is three miles, so anyone who has a set and intercedes will blot-out the signal you are trying to receive. Although it is not normally the best time of day for settling down to a computer game, Howell recommends the early hours of the morning, since it is quieter then and you are more likely to succeed with a longer program.

Another tip to avoid having to rewind the tape each time the program is not being received well is to add the following two lines to the end of a program:

```
9998 SAVE 'program name'
9999 GOTO 9998
```

Howell reckons the whole operation should also be possible with a ZX-81, although he has not put it to the test. So any Sinclair user with £50 to spare should be able to join the fun.

When he had a ZX-81, he says he rarely bought programs for it, preferring to write his own and not to look on it simply as a vehicle for games. He points out that even two years ago there were far fewer programs available in far fewer shops than there are today.

"I do not think it was such a bad thing when there were fewer programs. It meant you had to experiment and write a few yourself.

"Nowadays if someone has bought a few programs and then decides to write his own, it is bound to be far less professional. He is likely to be discouraged quickly because he knows that really good programs are available in the local shops".

Since buying a Spectrum, he admits he has found some of the games irresistable, especially The Hobbit, and he has tended to write fewer programs.

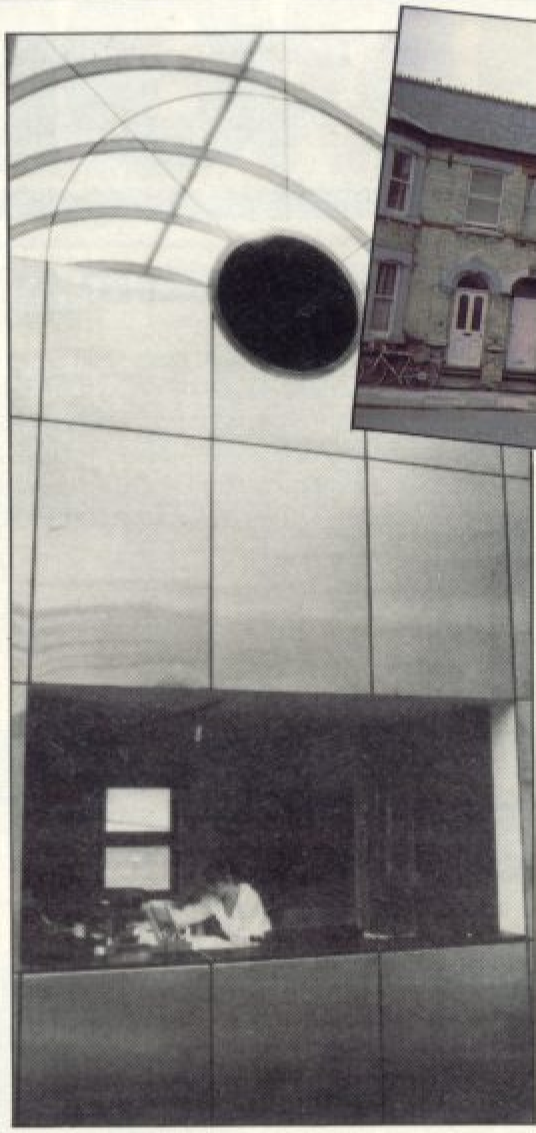
His only criticism of the Spectrum is its limitations on sound. Being a musician, he says the beep of the Spectrum cannot create many true notes — but with three musical instruments at home, it is not something which worries him unduly.

Howell is keen to start a club in his area for owners of Spectrums and CB sets and he suggests it as a good idea for any Sinclair users with CB sets who have like-minded friends living near them.

> 'I have never been so busy in my life. I am never bored'

Altogether, with his music, magic, cookery and computers, his is a busy life, in spite of the fact that he is unemployed. Once he has qualified as a computer programmer, it looks as if his will be a name to watch.







PEEPING from behind rows of terraced houses near the centre of Cambridge is the Sinclair Research ultra-modern new computer centre.

The architect, Cristoph Grillet, pictured left, of Lyster, Grillet and Harding, is said to have combined Cambridge traditions with major innovations in architectural design, interior furnishing and environmental control systems.

One of the ducts for the system can be seen in the picture on the immediate left above the office which overlooks the entrance hall. The hall is dominated by the sculpture, shown far left, Double Torso II by Helaine Blumenfeld.



Stainless Sinclair

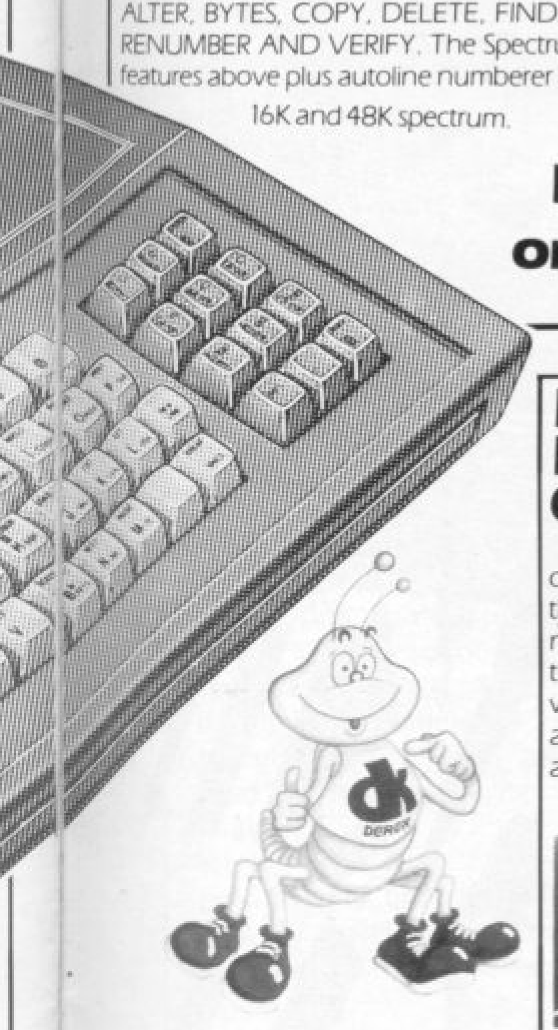


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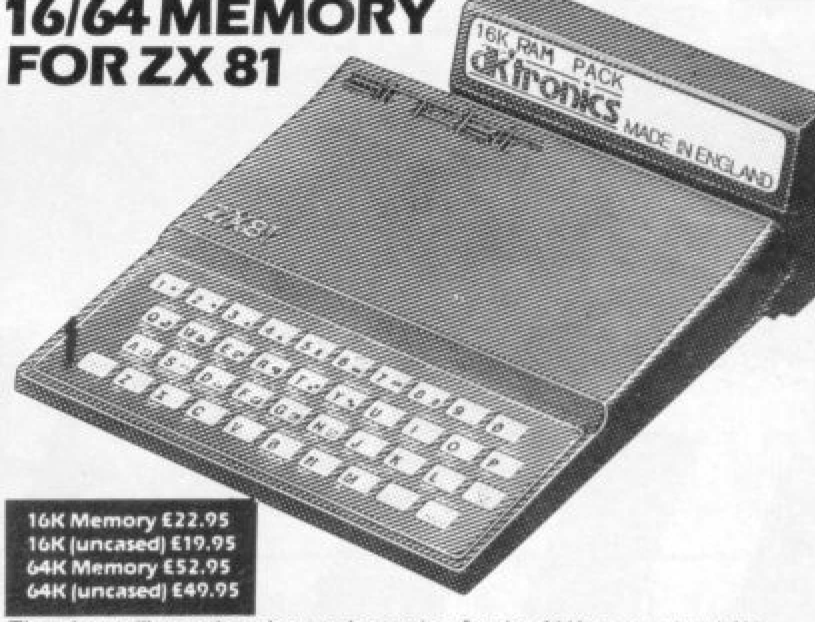
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John Gilbert reviews a possible competitor

Oric stakes its claim to the Spectrum market

THE ORIC ONE has been proclaimed by its manufacturer as the machine of the future. In the same breath it says that it is a machine which was designed to run in direct competition with the Spectrum.

The machine is impressive in many respects but its general performance during bench-testing was less so. Oric is manufactured in two versions. The first, and most inexpensive, is the 16K model. If, however, you want to do serious work with the machine it is a good idea to buy the 48K version, as Oric Products International does not plan to upgrade customers' 16K machines.

At the launch, the price of the Oric was set below that of the Spectrum and the specifications far exceed those of the Sinclair machine. The keyboard is bigger and more robust than that of the Spectrum but the keys are just as difficult to operate.

There are several output ports accessible through the back of the machine. The cassette interface uses a three-pin DIN socket for communication with an ordinary cassette player. The cassette interface will work at 300 baud for slow but reliable operation or at 2,400 baud for fast but less reliable saving and loading. The cassette interface works well but is not as accurate as the Spectrum output.

Next to the cassette port is the RGB — red, green, blue — monitor interface. It will allow you to plug a monitor straight into the back of the system with no other pieces of equipment added.

Also included in the range of ports is a Centronics interface for a printer and an output bus from which joysticks or external ROMs can be run. That set-up is more durable than that of the Spectrum but we could not make the Centronics interface work with a Seikosha printer, as the Oric always crashed.

The initial power-up of the machine can pose problems to a beginner to computing. The Oric will often produce very spectacular crash displays before it decides to settle down for the introductory frame to be displayed.

When the power is switched on, the computer will display the number of bytes available through the system. Initially there are 47,870 bytes but when programming starts the user will have access to only 40K of memory.

Unlike the Spectrum, the Oric has two main modes which allow memory to be used for text — program and data — or for high-resolution screen display. On the hi-res screen alphanumeric characters can be displayed only using string slicing and conversion of strings to their ASCII code values. It is therefore difficult to mix text and graphics if you are a beginner.

The Oric allows full re-definition of the character set. The alternative character set can be switched on through the Basic command LORES and the normal set can be switched back using the same command.

Oric International has implemented MicroSoft Basic on its new system. That version of the language seems to be an industry standard at present. The Oric implementation of it is certainly more powerful than Sinclair enhanced Basic. Most of the commands on the Oric can be mimiced on the Spectrum but the Oric also allows the user to write extended Basic subroutines, which will be implemented by defining new Basic commands. It is, therefore, possible to create your own extentions to the Basic language.

One extention which could be made in the language is the addition of Basic statements which would handle file input and output. On the Oric you have to save the variables area to save files but on the Spectrum you use LOAD DATA. This is not ideal for beginners who know little about memory maps and machine code.

The Oric One compares well to the Spectrum but there are several difficult areas. One is the manual; the booklets are being despatched with amendment sheets. In the first versions of the manual, some of the programs would not run as listed.

The author of the manual also seems to have devoted too much space to machine code programming on the 6502 processor. That space could be better-used by explaining the Basic language a little more coherently. At the moment the manual does not do justice to the machine.

'The Oric has been seen as a threat to the Spectrum. That may be true in the long run but at present there is a dearth of software'

The Oric has been seen as a threat to the Spectrum. That may be true in the long run but at present there is a dearth of software for the machine. The Spectrum has a tremendous software and hardware backing. It also has the name of Sinclair on it. At the moment Sinclair seems to have nothing to worry about but if Oric produces the promised peripherals in time, Sinclair could well have a fight on his hands.

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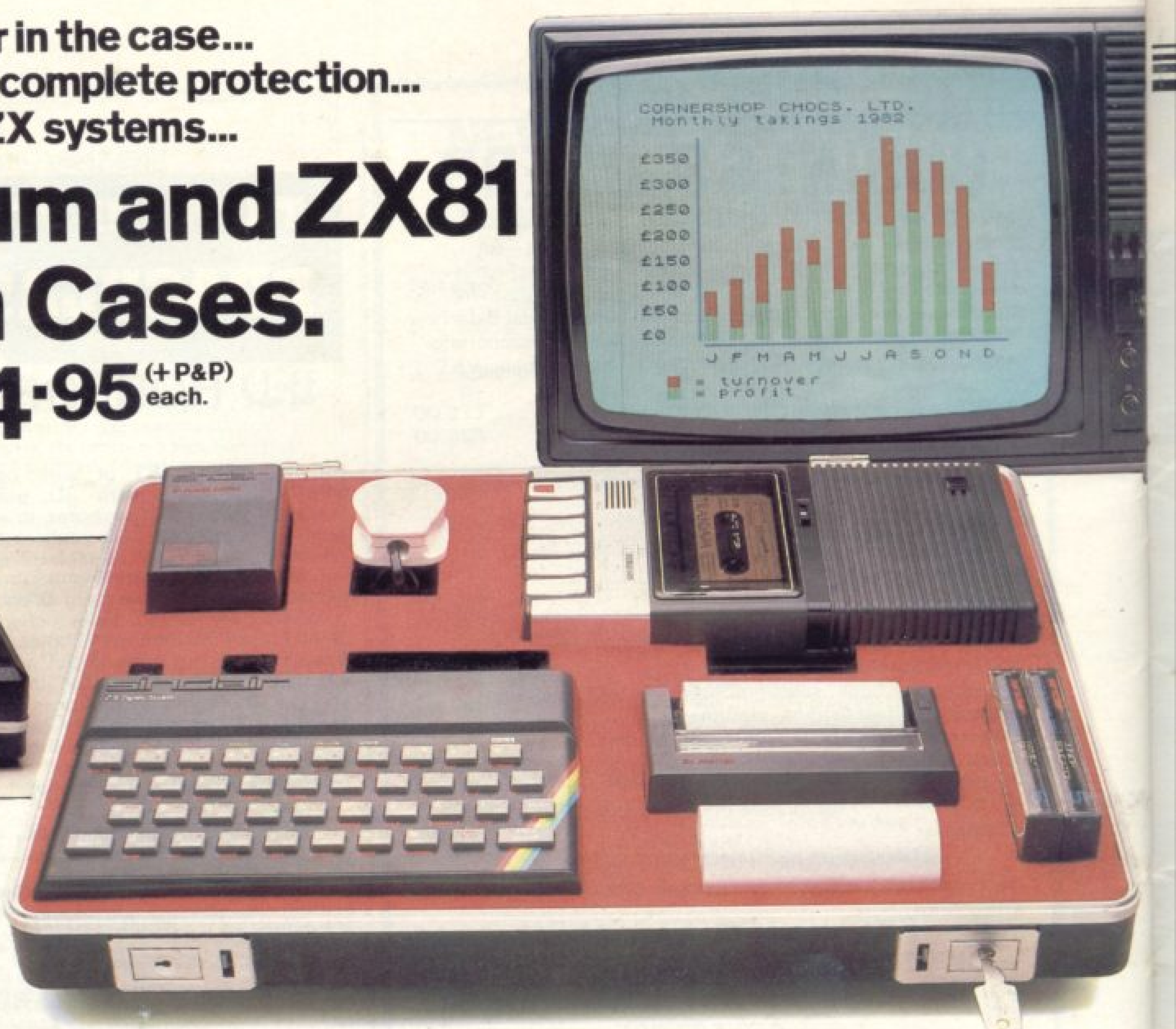
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SUS 305

John Gilbert completes his five-part series on how to write your own programs in Basic by showing how to find and correct errors

Clearing system bugs

IN THE FINAL article of the series I want to take you back to show you how a program is constructed in a series of numbered steps. To begin, however, I want to discuss errors which can occur in programs, commonly called bugs, and how to rid yourself of them.

Much has been written about bugs. The term is derived from the early days of computing when only large mainframe computers existed. They had to be, and still are, kept in specially protected areas where dust or insects could not enter the machinery. If computers were not kept clean and serviced they could often crash and data and programs could be lost.

Most of the bugs encountered by programmers occur because program structure is incorrect. The statements causing the crashes are usually the FOR . . . THEN and GOTO lines.

When a program crashes, look at the report code shown on the bottom of the screen and find the line number where the computer ceased the RUN. If you have been following the series you should know that a GOTO effect should be limited to one routine. If an error occurs at a certain line you have to look at that routine.

On some computers the system offers a command which prints-out the line number to which the computer goes during operation. It is called the TRace ON (TRON) routine. It can be simulated on a Spectrum if you wish to add an extra instruction to each of the troublesome lines. That instruction will make the computer print-out each line number as it is executed.

It is not important that you know how it works but for those who are interested the PPC system variable is PEEKed and the current line number returned from the two addresses accessed by the statement. The instruction to be appended to program lines is: PRINT PEEK 23621+256*PEEK (23621+1)

That instruction can be put anywhere any number of times. It is best to append it to the end of lines.

It is also possible to chart the course of FOR . . . NEXT loops. It is done by printing the variable used in the loop. The print statement should be put at the end of the FOR . . . statement and not at the end of the NEXT statement. If you do the latter the count printed will be incorrect. Both techniques are illustrated in diagram A — for GOTOs and — B for FOR . . . NEXT.

The two techniques can be incorporated together in a program and, with the error message you get when the program crashes you should be able to locate and correct the error.

Diagram A

```
   10 PRINT : PRINT PEEK 23621+25
6*PEEK (23621+1)
   20 PRINT PEEK 23621+2556*PEEK
 (23621+1): GO TO 10
```

When talking about these techniques and correcting errors, I must stress again that they will be of help only if you have used the structuring techniques which have been explained throughout this series.

I have detailed the pathway to structured programming, as explained in these articles, as a series of structured steps:

First: Decide what type of program you want and what you want it to do. It is best to write it as a series of statements in plain English.

Second: Decide how you are to handle the task and whether it can be done with your machine and with the level of experience you have.

Third: Break the task into a series of headings and sub-headings. For example, most programs need some form of instructive display — an entry procedure, a calculation procedure and an output procedure. They must be tailored to meet your needs.

Fourth: Draw a flowchart. That should take a long time in many cases. It is good idea to draw several charts, expanding the most important boxes in the main one. In that way you will know the concepts of the program before you begin coding. If flowcharting does nothing else it will concentrate your mind on what you want to do.

I have a word of warning to people who have taken flowcharting to their hearts. The technique is a means to an end and is not an end in itself. If you think a certain number of charts is necessary, draw them, but do not draw charts for the sake of doing so because you will often be confused as a result.

Fifth: Coding the program. The code, in this case using the Sinclair Basic language, should be laid out in separate modules. The control module should be put at the top, as it is the part of the program which will be used most. Each module should be complete and GOTO statements should be local to a module if possible.

Sixth: In long programs bugs, or errors, are liable to occur frequently. Bugs occur usually in the data entry parts of the program and in the flow structure. Flowcharting and structured programming will not dispose of all bugs but it will eliminate a few.

If you have followed the series you should be able to write reasonably complicated programs. As I have stressed, there are two factors which are important, more so than some of the others, which are necessary to make programming easier and more enjoyable.

Diagram B

```
10 FOR k=1 TO 10: PRINT k
20 PRINT
30 NEXT k
```

The first is structure. If your program is well-structured it will contain fewer bugs and will, in most cases, run faster. The second point is that the program must be designed for ease of use, so that it can be used by someone who knows nothing about computers.

If you have taken my advice, or even modified it using your own techniques, you are on the way to being an efficient programmer. You will find that you can do more and programming will become less of a difficult task and more rewarding.

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- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

rum

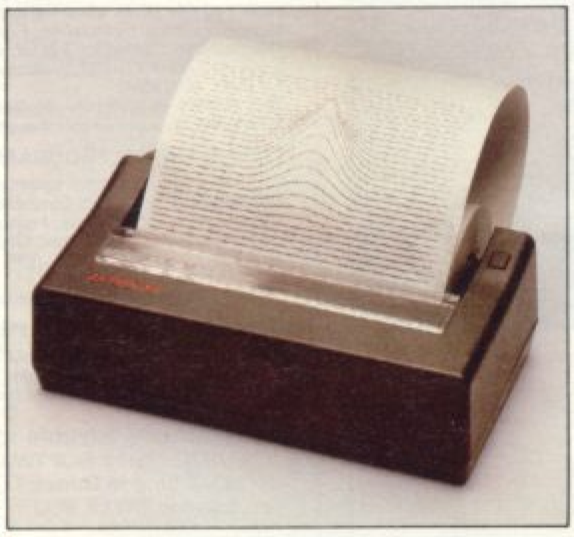


The ZX Printer–available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set–including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.



The ZX Microdrive–coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing by providing mass on-line storage.

Each Microdrive can hold up to 100K bytes using a single interchangeable storage medium.

The transfer rate is 16K bytes per second, with an average access time of 3.5 seconds. And you'll be able to connect up to 8 Microdrives to your Spectrum via the ZX Expansion Module.

A remarkable breakthrough at a remarkable price. The Microdrives will be available in the early part of 1983 for around £50.



ZX Spectrum software on cassettes–available now

The Spectrum software library is growing every day. Subjects include games, education, and business/household management. Flight Simulation...Chess...Planetoids...History...Inventions...VU-CALC...VU-3D...Club Record Controller...there is something for everyone. And they all make full use of the Spectrum's colour, sound, and graphics capabilities. You'll receive a detailed catalogue with your Spectrum.

ZX Expansion Module

This module incorporates the three functions of Microdrive controller, local area network, and RS232 interface. Connect it to your Spectrum and you can control up to eight Microdrives, communicate with other computers, and drive a wide range of printers.

The potential is enormous, and the module will be available in the early part of 1983 for around £30.

sinclair

**Sinclair Research Ltd, Stanhope Road, Camberley, Surrey GU15 3PS.
Tel: Camberley (0276) 685311.**

How to order your ZX Spectrum

BY PHONE–Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST–use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard, Access or Trustcard.

EITHER WAY–please allow up to 28 days for delivery. And there's a 14-day money-back option, of course. We want you to be satisfied beyond doubt–and we have no doubt that you will be.

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	Sinclair ZX Spectrum–48K RAM version	101	175.00	
	Sinclair ZX Printer	27	59.95	
	Printer paper (pack of 5 rolls)	16	11.95	
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The user-friendly approach is consistent throughout the text – not only are program listings clearly shown, but in many cases, a photograph is included to show what the program looks like when actually loaded and run!

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"Robin Bradbeer's book is well illustrated with photographs, drawings and diagrams which make the text easy to read and understand . . . after reading it, it shouldn't be long before the reader feels capable of tackling the machine in a masterful way."

Personal Computer News

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ZX SPECTRUM 48K

CYCLE PLANNER is not a game.

MEDIDATA announces a unique software package which establishes a genuine and lasting use for the home computer.

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Send orders to **MEDIDATA, PO Box 26, London NW9 9BW.**

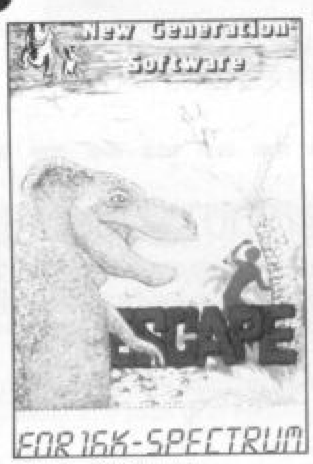
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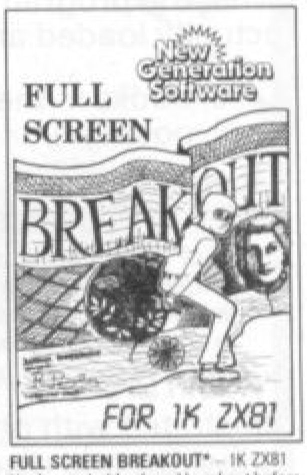
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You'll need plenty of stamina to escape the dinosaur infested maze. You'll have to find the axe and break out of the maze, but the Triceratops will be looking for you and the Pteranodon could swoop down on you at any time! **ONLY £4.95** "One of the best and most original games we have seen for the Spectrum so far" Sinclair User.



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Fancy yourself as a spacefighter? Here's your chance to find out how good you would be in defending your home planet. A fast moving machine code game in 3D with meteors, stars, explosions, plasma blasts, photon beams and of course alien space craft to look out for! Your cockpit display will show shield strength, altitude, proximity, forward radar and your score. **ONLY £4.95** "Another 3D winner" Sinclair User.

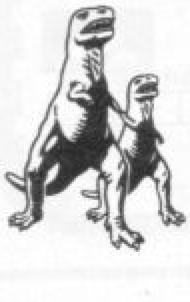


3D MONSTER MAZE* – 16K ZX81
The ultimate 3D maze game for your ZX81, not only do you have to find your way out of the maze but you'll have to watch out for the T.Rex – it will actually run towards you when it sees you! Fast moving machine code graphics. **ONLY £4.95** "If I had to choose just one program to impress an audience with the capabilities of the ZX81, the 3D Monster Maze would be the one without doubt" ZX Computing.



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Talking in languages the computer understands

John Gilbert reviews the latest books on machine code

MANY SINCLAIR owners are turning their attention to machine code and trying to program either in direct Z-80 low-level code or in assembly language. Publishers have also entered that area of the market and several good books have been produced.

Melbourne House has two new books which cover machine code and related subjects more than adequately. The first is by Dr Ian Logan, author of several books and pamphlets on the ZX-81 ROM. *Understanding Your Spectrum* covers both Basic and machine code programming. Its aims are to show how the Spectrum works, to teach Z-80 machine code, and to give the reader an understanding of the ROM operating system in the machine. Logan does all those things in a very expert manner which even the beginner should understand.

The other book from Melbourne House is *Spectrum Machine Language For The Absolute Beginner.* It is even easier to understand than Logan's. It starts from a very simple base and takes the reader through most of the Z-80 instruction set as implemented on the Spectrum.

The theory is supported by practical examples which can be entered and run by anyone. The book is completed by taking the reader from conception to the completion of an arcade game, Frogger, written all in machine code.

Both books are excellent in content but a little over-priced. *Understanding Your Spectrum* costs £7.95 and *Spectrum Machine Language For The Absolute Beginner* £6.95. If you are thinking of programming in machine code, the books will teach you almost everything you want to know.

A good alternative is *Introducing Spectrum Machine Code* by Ian Sinclair. It provides an easy introduction to machine code but does not offer so much in terms of content as the Melbourne House issues.

Sinclair begins by introducing the reader to ROM and RAM. He shows how both those systems are used to give the user an easy way of programming. He then provides a long discussion of Z-80 programming. The book is sprinkled adequately with examples and many of the machine code routines explained are put into Basic listings in the form of DATA, to allow the user to enter them quickly. *Introducing Spectrum Machine Code,* from Granada Publishing, costs £7.95.

The range of books not aimed at a particular computer is growing. Several will prove useful to Sinclair owners.



Some Useful Basic Subroutines again is written by Ian Sinclair. He uses Micro-Soft-type Basic and some of the routines will need re-writing to work on Sinclair machines. The book would be of great value to ZX-81 users, as it includes Basic routines for flashing, scrolling and centring titles, underlining titles and sorting data. From Newnes Microcomputer Books, it is good value at £4.95.

Get More From Your Personal Computer is another title from Newnes. The author is Ian Hickman. It deals with the development of the computer, explains Basic programming and then the principles behind number systems, logic diagrams and, finally, machine code.

It works well as a general guide to the principles of computing and the way in which humans and computers interact. It costs £5.95.

Another general book of interest to Sinclair users is *Programming With Graphics* by Garry Marshall. It takes the reader through the various types of graphics on computer systems — block, pixel and high resolution. There are also chapters dealing with the production of graphic displays, three-dimensional representation and animation.

For those wishing to produce arcade games or who want to demonstrate physics experiments on the screen, the book is ideal. If you want to know how those images on TRON were created, but at a much simpler level, you will get some idea from the book. It is available from Granada and costs £5.95.

The Youngs Computer Register for the ZX-80 and ZX-81 has just been re-published. It now contains an extra supplement with invaluable information on the Sinclair market.

The guide lists the names and addresses of most software and hardware companies and also provides information on products. As with the previous issue, the register is split into sections for easy reference.

Together with the supplement, it can be obtained from Youngs Computer Publications for £3.95. The supplement is also available separately for £2.

The quality of books both in content and packaging is improving as the market expands. Computer books are now finding their way from the technical to the general sections of bookshops. That is a good move, as it will make more people aware of the computer market.

Melbourne House (Publishers) Ltd, Glebe Cottage, Glebe House, Station Road, Cheddington, Leighton Buzzard, Bedfordshire LU7 7NA.

Granada Publishing, PO Box 9, Frogmore, St Albans, Hertfordshire AL2 2NF.

Newnes Microcomputer Books, The Butterworth Group, Borough Green, Sevenoaks, Kent TN15 8PH.

Youngs Computer Register, 2 Woodland Way, Gosfield, Halstead, Essex CO9 1TH.



GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.
Bug — an error in a program.
EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultra-violet light. The memory can then be re-programmed using an electrical device called an EPROM blower.
Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.
Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.
Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.
Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.
Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.
Port — a link to the outside world which can be used by programs and the computer.
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.
RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.
ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.
Software — programs which control the operation of the computer.
Syntax error — a bug caused by incorrect use of a programming language.

Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 94

Starting from Scratch

continued from page 93

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is that important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

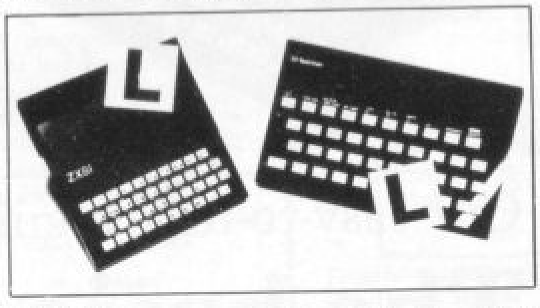
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD "" followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.



ONLY 19·95 +£1·00pp

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The Interface Module II has been specially designed to plug on to the rear connector of your ZX Spectrum or ZX81 and allow you to connect any standard Atari type digital Joysticks. All of the computer's connections are duplicated on an extension connector so that you can still use any other devices intended for use with your computer.

The Interface Module II resides in the same memory space as the keyboard, which remains fully functional at all times, therefore it will not interfere with anything else connected.

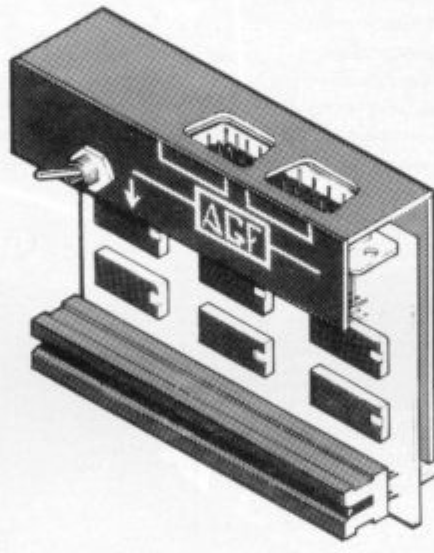
When a suitable joystick is plugged into 'Player 1' socket its action will mimic pressing the cursor keys, up "7", left "5" and so on. The firing button will simulate key ϕ. This unique feature guarantees the best software support.

Take a look at the selection of compatible games we have listed. More are being added all the time as a result of our contact with the various software companies.

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Using joystick control in your own programs is as easy as reading keys. Eight directions and Fire are all read by simple BASIC. With every order there comes a free demonstration program called 'Video Graffiti' plus a full set of instructions.



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A SELECTION OF COMPATIBLE SOFTWARE

ZX SPECTRUM

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CampbellStstems	Gulpman
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	Meteroids
ICL	Star Trail (Man.Dock)
New Generation	☐ Escape £4.95
Software	☐ 3D Tunnel £5.95
Psion	* Flight Simulation
	VU–3D
Silversoft	Ground Attack
	☐ Cyber Rats £5.95

ZX81

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"Excellent" A.R. West, Surrey. "First-time loading, user-friendly, superb documentation" J.E. Mann, Leeds.

THE DATABASE



Whether you want to update mailing lists, manage customer accounts, or simply produce an index of your record collection, THE DATABASE makes it easy and enjoyable. A breakthrough in power *and* practicality, THE DATABASE allows you to store information on any subject in the way *you* want, and gives you a full range of commands to display, update, sort, search and print – even perform calculations. Massive storage capacity: 1,000 lines in memory at a time, over 7,000 names and addresses on a single C90 cassette. See for yourself why THE DATABASE is the most advanced 48K Spectrum database available – far more powerful *and* practical than Sinclair's VU-FILE and all other "competitors".

THE SPREADSHEET



Based closely on Visicalc, the world's best-selling program, THE SPREADSHEET turns your 48K Spectrum into a "super-Calculator" that helps you solve all kinds of number-based problems quickly and easily. Hundreds of applications in business, engineering and science – and just as versatile for home finance management. Invaluable in education too, helping develop maths ability and confidence. In power, flexibility and ease of use, THE SPREADSHEET outperforms all other Spectrum spreadsheets – including Sinclair's VU-CALC. See for yourself, with the security of MiCROL'S 14 day money-back Guarantee.

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Please explain arrays for us woodenheads

This month our expert correspondent, Andrew Hewson, deals with some fairly straightforward software queries before attempting to explain something more complicated about machine code routines

BY ANSWERING a few fairly straightforward software questions and then finishing with a reasonably lengthy machine code routine for those who like that type of thing, I have tried this month to provide something of interest to everyone. Peter Bankes of Debenham asks: **Is it possible to poke the Spectrum to get caps lock?**

The caps lock condition is stored in bit 4 of FLAGS2 at address 23658 in the system variables area. When bit 4 is set, all entries will appear in capitals. Hence a program can determine whether caps lock is set by checking the status of that bit and altering it if required.

The condition of bit 4 may be checked from Basic in a somewhat cumbersome fashion as illustrated by:

```
10  IF INT(PEEK 23658/8)=2*INT
    (INT(PEEK 23658/8)/2) THEN
    PRINT "CAPS LOCK NOT
    SET": GOTO 30
20  PRINT "CAPS LOCK SET"
30  STOP
```

To set bit 4 from Basic and hence turn on the caps lock enter

POKE 23658, PEEK 23658+8

To turn it off again, enter

POKE 23658, PEEK 23658-8

Alternatively you may wish to use the ROM routine which "toggles" the caps lock. The routine is located at address 4317 (10DD hexadecimal) and successive calls of the form

RAND USR 4317

turn the caps lock on and off.

Peter Hollis of Newcastle has another problem concerning the Spectrum. He writes: **I have seen a number of program listings which have user-defined graphics characters embedded within them but with no accompanying explanation of how the characters are formed. I have no idea of how to reproduce them on my machine. Can you help?**

The 21 user-defined graphics characters available on the Spectrum are accessed by entering SHIFT 9 followed by one of the 21 letters A to U followed by SHIFT 9. When the Spectrum is turned-on the 21 characters are set to copies of the appropriate letter and so entering SHIFT 9 before and after pressing a letter key makes no apparent difference to what is displayed. Thus the command

PRINT "A"

causes a letter A to appear in the top left-hand corner of the screen, regardless of whether the SHIFT 9 is entered before and after the letter A.



• *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

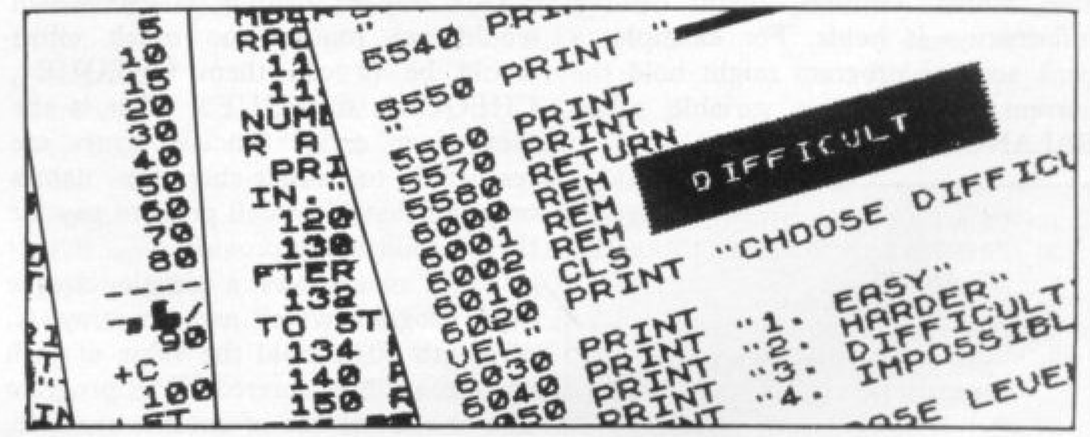
If the user-defined graphics character assigned to the "A" key is re-defined the new character will always subsequently be used. The new character will appear at the appropriate time when the program is executed and it will also appear in listings of the program, both on the display and on the Sinclair printer.

Hence there is a problem when programs are published, because the new characters are shown in the listing with no reference to the key to which they are assigned.

A possible solution is to study the listing to try to deduce which keys have been used. Usually the author includes a loop into his program of the form:

```
10 DATA 0,12,14,4,60,124,60,0
20 FOR I=0 to 7
30 READ A
40 POKE USR "D"+I,A
50 NEXT I
```

Such a loop reads the eight values in turn which are used to define the shape of the new character, from the DATA statement into the variable A and then POKE them into the relevant locations in memory. In this case it is the graphics character assigned to the letter "D" which is being re-defined.



If you can locate similar loops in the problem program you can identify which keys have been used. You can then RUN the program, BREAK into it, and then press the keys in turn — preceded and followed by SHIFT 9 — to discover which shape has been assigned to which key.

Unfortunately there are several ways

continued on page 102

continued from page 101

of re-defining graphics characters, that technique being one of the simplest. Therefore you may not be able to determine which keys have been used, in which case trial and error using the keyboard is your only remedy.

John Brookes of Bromsgrove bought his first home computer — a Spectrum — and read several books on the machine but he is having difficulty with the concept of an array. He writes: **The books are generally easy to read but none of them explains arrays sufficiently clearly for us wooden-headed types. Can you help?**

Most tasks performed by computers comprise reading information into memory, manipulating the information according to a program of stored instructions, and writing the information out of memory.

The information stored in memory must be organised in some convenient fashion so that the person who writes the program of instructions can do his job. Most high-level languages allow the programmer to declare variables of various kinds so that different types of information can be stored and treated in appropriate ways.

The ZX-81 and the Spectrum each allow six types of variables — numeric with a single character name; numeric with a multiple character name; control for a FOR-NEXT loop; string; string array; numeric array.

The first two types are identical in use, as they can each store only a single positive or negative number. Most programmers try to give a name to a variable which reminds them of the information it holds. For example, a bank account program might hold the current balance in a variable called BALANCE.

```
10  PRINT AT 0,11;"CHEQUEBOOK"
20  PRINT AT 2,0;"ENTER CURRENT
    BALANCE"
30  INPUT BALANCE
40  DIM C(30)
50  PRINT AT 2,0;"ENTER EACH
    CHEQUE IN TURN"
60  FOR I=1 to 30
70  PRINT AT 4,0;"CURRENT
    BALANCE= ";BALANCE
80  INPUT C(I)
90  LET BALANCE=BALANCE-C(I)
100 NEXT I
110 CLS
120 PRINT "CHEQUE NO.","VALUE"
130 FOR I=1 TO 30
140 PRINT I,C(I)
150 IF PEEK 16442-3 THEN SCROLL
160 NEXT I
```

Table 1. A simple cheque book program.



In many programs similar information is to be stored concurrently and in that situation the program is also likely to become unnecessarily cumbersome because the same operation must be performed on many variables, each with a different name and therefore requiring a separate piece of code.

The bank account program might be required to store the amount spent using each of 30 cheques in a cheque book. The amount spent using the first cheque could be stored in a variable called CHEQUE. The same variable could not be used to store the value of the second cheque because only one value can be stored in a numeric variable.

The act of entering the second value "over-writes" the first value, causing it to be lost, hence the programmer must think of a new name for the second cheque. Most programmers would run out of inspiration long before they had named all 30 cheques.

One way of naming all 30 which would not require too much effort would be to call them CHEQUE1, CHEQUE2, CHEQUE3. That is the idea of an array. Sinclair arrays are restricted to single-character names only but that is a small price to pay for the flexibility they provide.

Table one shows a simple cheque book program which uses an array, C, of length 30 to hold the value of each cheque as it is entered. The program also shows the use of another variable, I, to count through the array selecting each element of the array in turn. When all the cheques have been entered the program prints the value of each in turn.

Simon Smith of Battersea, London has a more complex question concerning arrays. He writes: **I have a ZX-81 and recently bought a 64K memory to replace the 16K RAM pack I had previously. I now want to enlarge the array in a program which indexes my record collection to make use of the extra memory space. Is there any way of doing so, short of copying the data to another array?**

Defining a new array and copying the data across using a FOR-NEXT loop would certainly be the easiest way of dealing with the problem. The disadvantage is that the new array can occupy only the space which is not used by the old array; hence when the old array is deleted — by DIMensioning it to zero — the memory space it occupies remains unused. If the old array was 12K bytes long and a further 32K bytes of memory was added, the new array could occupy only 32K of the total of 44K bytes available.

There is no Basic command to make an array grow to fill the remaining memory space and so I have written the machine code routine listed in table two to do the job. The routine can be loaded into a REM statement forming the second line in a ZX-81 program using a hexadecimal loader. For example:

```
10 REM XA$
20 REM AT LEAST 108 CHARACTERS
30 FOR I=16523 to 16630
40 INPUT Z$
50 IF Z$="S" THEN STOP
60 PRINT Z$;"   ";
70 POKE I,16*CODE Z$+CODE Z$(2)-476
80 NEXT I
```

To load the machine code routine, run the loader and enter each pair of hexadecimal codes in turn. Be very careful not to make mistakes because the program makes no error checks.

To use the routine to double the size of a string array called A$ make the first program line a REM statement containing an 'X' followed by the name of the array, i.e., A$ as in the loader. Then POKE the factor by which you want the array to grow into the first byte of the REM statement. In that case the array is to grow by a factor of two so you should enter:

POKE 16514,2

Then call the machine code routine by entering:

RAND USR 16523

Both the total length of the array and the size of the first dimension will grow by the factor specified at address 16514.

The routine makes a number of error checks. It will detect if the named variable does not exist or is not an array. It also ensures that there is sufficient room in RAM to enlarge the array by the factor specified.

The routine makes use of two ROM routines. The first is LOOKVARS

which is located at 4380 decimal — 111C hexadecimal. That routine finds the location in the variables area of the variable pointed to by CH-ADD and returns the address in the HL register pair. The second ROM routine, MAKE SPACE, inserts BC bytes at the address pointed to by HL.

The operation of the routine can be checked by adding the following lines to the hexadecimal loader:

```
1000 DIM A$(2,3)
1010 LET A$(1)="ABC"
1020 LET A$(2)="DEF"
1030 GOSUB 2000
1040 POKE 16514,2
1050 RAND USR 16523
1060 GOSUB 2000
1070 STOP
2000 LET W=PEEK
16400+256*16401
2010 FOR I=W TO W+21
2020 PRINT I,PEEK I
```



```
2030 NEXT I
2040 PAUSE 32768
2050 CLS
2060 RETURN
```

Execute the test program by entering:
RUN 1000

The program declares an array A$ and PRINTs the contents of the first 22 bytes of the variables area where the array is held. The user can note the contents of the display and compare it to the format of an array as shown on pages 173 and 174 of ZX-81 Basic Programming.

The program then doubles the size of the array and displays the first 22 bytes again. The user will see that the total length of the array has increased appropriately and that the size of the first dimension has doubled.

With a little care the routine can be adapted to run on the Spectrum. The ROM routines LOOKVARS and MAKE SPACE are located at 10418 and 5717 respectively — 28B2 and 1655 in hexadecimal. CH-ADD is at 23645 — 5C5D hexadecimal. It is also necessary to alter the addresses at which the scale factor and the name of the array are stored.

Table 2. A ZX-81 routine to enlarge an array dynamically.

Hex code	Assembler code	Comment	Hex code	Assembler code	Comment
3A 82 40	LD A,(16514)	Return if	09	ADD HL,BC	Set HL to
FE 01	CP 1	parameter	38 2B	JR C,43	new length.
D8	RET C	is zero.	D1	POP DE	
21 83 40	LD HL,16515	Set CH-ADD.	E5	PUSH HL	
22 16 40	LD (16406),HL		A7	AND A	
CD 1C 11	CALL LOOKVARS	Find array.	ED 52	SBC HL,DE	Set BC to
D8	RET C	Return if	44	LD B,H	increase
C0	RET NZ	numeric.	4D	LD C,L	in length.
7E	LD A,(HL)	Return	E1	POP HL	
FE 80	CP 128	if	E3	EX (SP),HL	Set HL to
D8	RET C	string.	E5	PUSH HL	address of
23	INC HL	Set A to	19	ADD HL,DE	end of array.
23	INC HL	number of	23	INC HL	
23	INC HL	dimensions.	CD 9E 09	CALL MAKE SPACE	Enlarge array.
7E	LD A,(HL)		E1	POP HL	
CB 27	SLA,A	Multiply by	D1	POP DE	
06 00	LD B,0	two and	73	LD (HL),E	Insert new
CB 10	RL B	add one,	23	INC HL	length.
3C	INC A	transfer	72	LD (HL),D	
4F	LD C,A	to BC.	23	INC HL	
2B	DEC HL	HL points to	23	INC HL	
56	LD D,(HL)	length.	4E	LD C,(HL)	Set BC to
2B	DEC HL	DE is	23	INC HL	first
5E	LD E,(HL)	old length.	46	LD B,(HL)	dimension.
E5	PUSH HL	Save.	11 00 00	LD DE,0	Calculate
D5	PUSH DE		EB	EX DE,HL	new first
EB	EX DE,HL	Set DE	3A 82 40	LD A,(16514)	dimension.
A7	AND A	to old	09	ADD HL,BC	
ED 42	SBC HL,BC	data length.	3D	DEC A	
EB	EX DE,HL		FE 00	CP 0	
21 00 00	LD HL,0	Calculate	20 FA	JR NZ,-6	
3A 82 40	LD A,(16514)	new data	EB	EX DE,HL	
A7	AND A	length.	72	LD (HL),D	Store new
19	ADD HL,DE		2B	DEC HL	first
38 33	JR C,51	Jump on overflow.	73	LD (HL),E	dimension.
3D	DEC A		C9	RET	
FE 00	CP 0		E1	POP HL	If overflow
20 F8	JR NZ,-8		E1	POP HL	then return.
			C9	RET	

THE ACID



Quentin Heath returns to Middle Earth with the help of some readers and discovers ways of getting nearer his golden goal

Ringing success for the Hobbit hunters

I DID NOT realise that the response from The Hobbit article two months ago would be so great. The game has caused so much interest that I have decided to devote this month's column to how readers are coping with this adventure.

First, however, I would like to digress to tell you something which I discovered about the Spectrum when playing this and other machine code games. Most machine code games use a Basic loader program to load code.

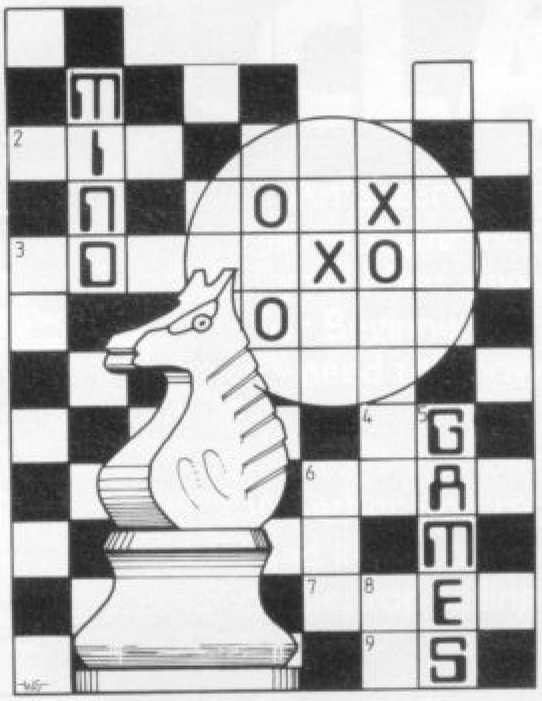
Usually if you use LOAD and try to break out of it, the system is designed to crash. If, however, you use MERGE instead of LOAD, the computer will stop after the Basic loader has been entered and will not auto-run the machine code. There are ways to circumvent this, for instance loading machine code straight into the system, but software manufacturers should be warned of the danger.

Back to The Hobbit. One reader, John Hardman of Welling, Kent, claims to have finished the adventure. He sent

> 'It is better to kill Gollum as soon as you see him. If you do not he may slip through your fingers'

me a copy of the last frame of the game to prove it. The next highest score attained during play so far is 67.5 percent by Dave Newton of Bolton, Lancashire. He says that he found no pitfalls in Beorn's house. I know of five people who have fallen in the shape changer's happy home.

Dr Paul Holmes of Middlesbrough sent a map of part of the game. He has not had much luck with Gollum and the ring and asks what is the answer to the first riddle. It has always been my



policy to kill dumb animals in adventures and this is no exception. It is better to kill Gollum as soon as you see him. If you do not he may slip through your fingers or you could be choked by his.

Holmes also wants to know what is the goblin's cache and where it can be found. To find it you will have to be captured and put into the goblins' dungeon. You will find some sand on the floor.

If you DIG you will find a trapdoor. Hobbits are not strong animals, so ask Thorin several times to SMASH or BREAK the trapdoor. When it is broken you will find the cache in a hole beneath it. I am not giving away all the secrets, however, and you will have to decide what to do with it.

In the March issue I stated that several people were having difficulties when they got through the barrels and tried to go through the trap door in the Elven King's cellar. That happened to me and I have now found that unless you have the ring on your finger the program may crash. That means you will have to go through the goblins' tunnels before attempting to get into the barrels and rolling through the trapdoor.

I have found what may be a bug in the program when typing entries into the computer. Reader Hardman, who claims to have finished The Hobbit, warned me about the potential problem. Try typing DO in reply to the program prompt. The program seems to read a variety of responses and put them all on the screen. If you type-in DOW, according to Hardman, your program could crash.

With the help of reader Colin Appleyard I have found the golden key in the Misty Mountains. His instructions are to go north from the Misty Mountains, then north-east, north, south-east, down three times until you are in the misty valley, then east, take the key, up, west, north and you are back on the mountain again.

I have no doubt that The Hobbit will recur in a future article and I would still like to hear from you if you have been playing the game. Next month I shall be looking at Dungeon Master from Crystal.

Hints and tips

Kill Gollum if the ring you find,
His riddles will only fog your mind.

A rope is as good as a boat.

If with your sword at the web you hack,
You'll find yourself defenceless against attack.
If when you finish you retreat to the east,
Just be prepared or you'll be deceased.

•If you have views on any mind games or if you have hints and tips on adventure games, computer-moderated games, chess, or anything along those lines you can contact me. I will also try to answer any questions which you may have. The address is:

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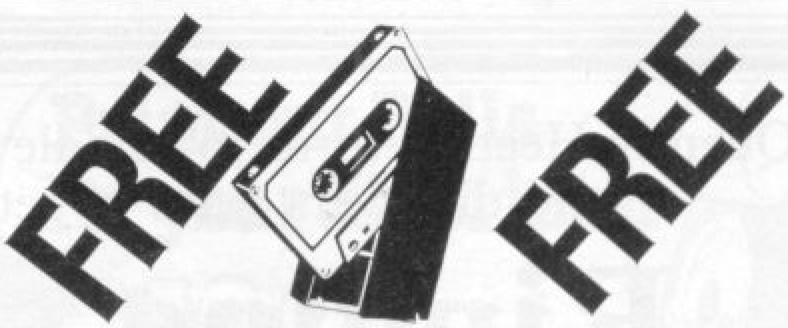
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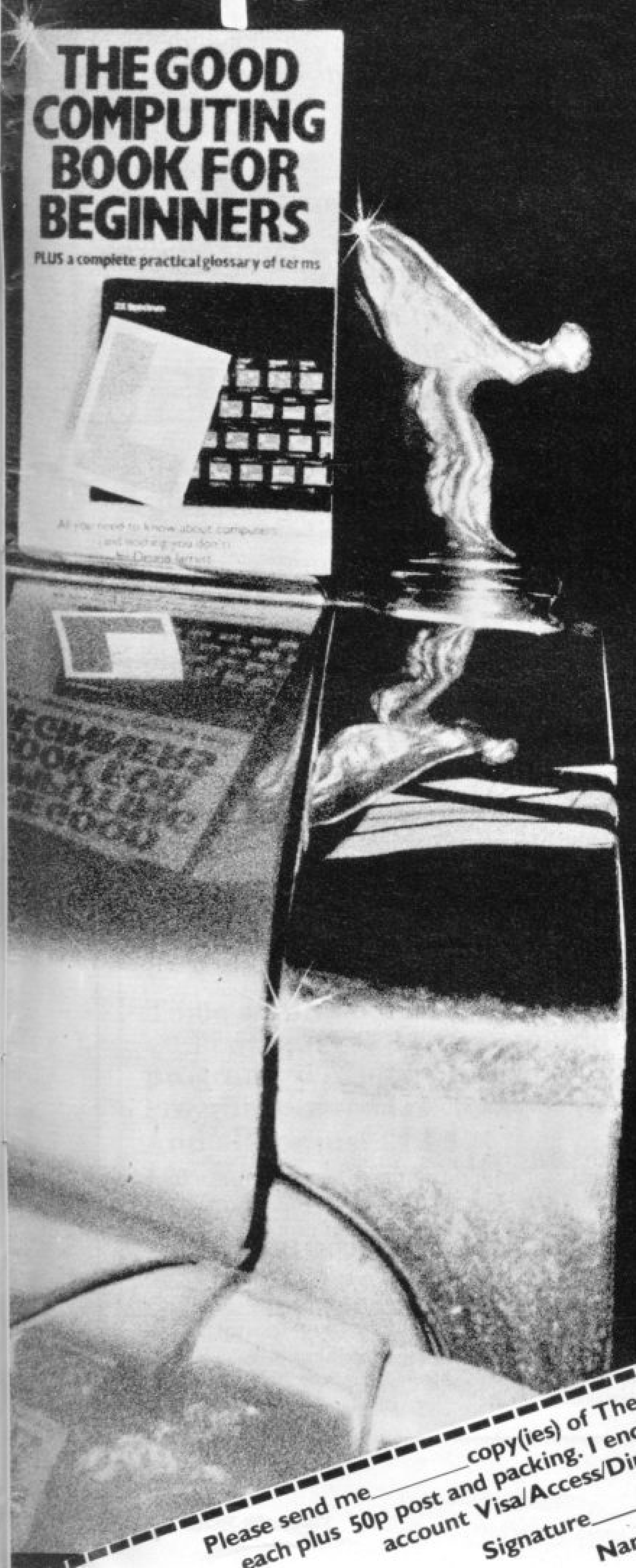
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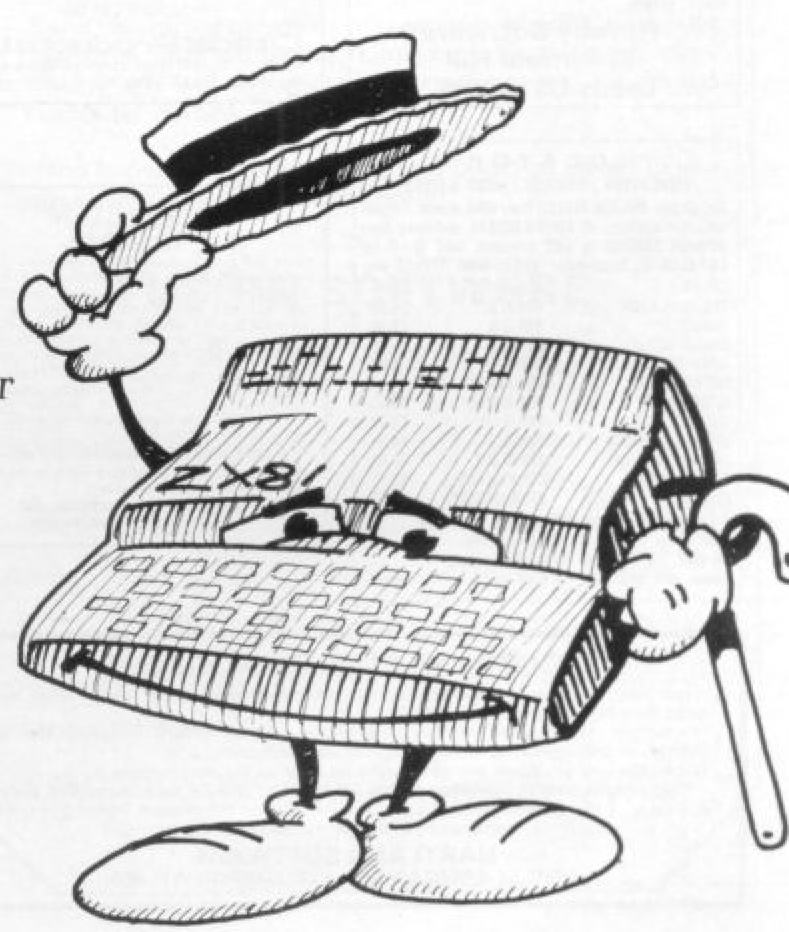
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